# ENGINEERING LITERATURE

M. N. Baker, Editor

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Recent numbers of the "Journal of the Association of Engineering Societies" have been unusually thin. Perhaps this is due to the fact that they followed the summer vacation season, when the various affiliated societies held few or no meetings. But there have seemed to be evidences, of late, that there was not an over-abundance of good matter for the "Journal." It is sincerely to be hoped that this is not the case, or if so, that such a condition will not continue. The "Journal" has been of great service in bringing together in handsome and convenient form valuable material, much of which would have been available to only a few, even if printed at all, had it been left for publication by the several affiliated organizations. For our part we heartily wish that more, even if not all, the local societies were included in the association. As it is, the clubs and societies at Boston, Buffalo, Cleveland, Detroit, Cincinnati, Minneapolis, St. Paul, and St. Louis, the state organizations of Louisiana and Montana, and the still broader Technical Society of the Pacific Coast, are members of the general association. A few of the other state and city organizations publish very creditable proceedings, but some of them contain only an occasional paper of value, and the papers read before all the local societies, in so far as they are of permanent value, would be far more useful if they were only more generally available. Few engineers can give shelf room for the proceedings of the various local societies, even if they could afford to join all the societies, and supposing it were practicable to harbor such a multitude of publications the individual could scarcely afford the time to so index them that their contents would be available. As matters stand we are now running too much to quantity, both in numbers of societies and in engineering literature. There should be a reform in the direction of quality, and in making more readily available existing sources of information. If the association of Engineering Societies has outlived its usefulness, which we do not for a moment believe, then a substitute for its excellent work of the past should be provided at once; but so long as it holds the field let it be well supported by at least those who have pledged to it their allegiance.

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The housing problem has long been an absorbing one abroad, both to municipal authorities and citizens in their private capacity, but in America it has received comparatively little attention from any quarter, and scarcely a bit from city officials. By far the most notable American publications on the subject have been the eighth special report (1895) of the U. S. Department of Labor on "The Housing of the Working People," now out of print, and the report made in 1900 by the New York Tenement House Commission. To these reports has just been added a group of valuable papers in the last number of "Municipal Affairs." These include separate papers on "Housing Conditions" in the United States, England, Germany, and France, and another collection on "Remedies," embracing considerations of rapid transit, the taxing power, municipal homes for the very poor, socialism, municipal regulation, enlightened management on the part of owners and tenants, and coöperative housing. The paper advocating municipal regulation instead of ownership is by Mr. Robert W. De Forest, who was chairman of the New York Tenement House Commission of 1900, and is now at the head of the Tenement House Department of New York, which came into existence a year ago. It is hardly necessary to say that regulation is much more in accord with American ideas on this subject than municipal ownership of tenement houses.

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It may be explained here that "Municipal Affairs" is a quarterly journal, published during the past five years by the Committee on City Affairs of the Reform Club of New York City. It has served a most useful purpose by securing and publishing able papers and groups of papers on a variety of municipal problems not adequately treated elsewhere, partly because extended treatment has been outside the scope of the engineering, economic and literary weeklies and monthlies. In the issue already mentioned there are, besides the symposium on housing, papers on the "Disposal of the Dead in Cities" and on "A Civic Center for New York," besides a number of book reviews. In some respects the most valuable feature of "Municipal Affairs" is its carefully made and extensive "Bibliography of Municipal Problems and City Conditions," which aims to include references to all books, pamphlets, reports, and magazine articles of interest to students of city government which appeared in the three months preceding each quarterly issue. Early in 1901, all the references previously published were revised and rearranged in a single volume. It should be stated that the first number of this Bibliography occupied the whole of the first issue of the journal in question, and ranged back over a number of years; also that the references to books include publisher, date and price.

We take pleasure in calling attention to both the journal and the bibliography because they are examples of much-needed work, done for the public good and not for profit, and because we believe they are too little known and appreciated.

## The Merits and Limitations of Twelve Books of Earthwork Tables.

The selection of a book of tables for use in computing earthwork is a problem which sooner or later almost every engineer is liable to face. Since there are many books containing extended tables of this sort, some of which are quite expensive, besides any number of others giving small tables of one kind or another, the selection of the best may be a serious matter to any person who is not well informed as to the respective merits of the various tables now available.

The problem has been brought to our attention by the following letter from Mr. J. A. Lilly, of Shelbyville, Ind., under date of Dec. 31, 1902:

> Sir: I would like to purchase a book of excavation and embankment tables, and want the best of the kind published. I do not want formulas, but tables, particularly such as give the area of a cross-section for varying width of roadbed (b), height of fill (h), and slope (s) of sides.

As this question bids fair to interest so many engineers we shall discuss in some detail the merits and limitations of the twelve best known works on the subject, comprising all known earthwork tables (in English) not out of print.

Rice's "Tables of Excavation and Embankment" (9½ × 13½ ins.; pp. 93; $7.50) contains the most complete set of tables of a certain kind yet published. But it has some limitations beside the price. The tables give either the number of cubic yards, or the area in square feet, corresponding to level cross-sections having the following "arguments" (see accompanying figure):

| b = | s = | | | | | |
|---|---|---|---|---|---|---|
| 9 | ..... | ..... | ..... | 1½ to 1, | ..... | ..... |
| 10 | ..... | ..... | 1 to 1, | 1½ " 1, | ..... | ..... |
| 12 | ..... | ..... | ..... | 1½ " 1, | ..... | ..... |
| 14 | ..... | ..... | 1 to 1, | 1½ " 1, | 2 to 1, | ..... |
| 15 | ¼ to 1, | ..... | ..... | 1½ " 1, | 2 to 1, | 3 to 1 |
| 16 | ..... | ..... | 1 to 1, | 1½ " 1, | ..... | ..... |
| 18 | ¼ to 1, | ..... | 1 " 1, | 1½ " 1, | ..... | ..... |
| 20 | ¼ " 1, | ½ to 1, | 1 " 1, | 1½ " 1, | ..... | ..... |
| 22 | ..... | ..... | 1 " 1, | 1½ " 1, | ..... | ..... |
| 24 | ..... | ..... | 1 " 1, | 1½ " 1, | ..... | ..... |
| 26 | ..... | ½ to 1, | 1 " 1, | 1½ " 1, | ..... | ..... |
| 28 | ..... | ..... | 1 " 1, | 1½ " 1, | ..... | ..... |
| 30 | ..... | ½ " 1, | 1 " 1, | 1½ " 1, | ..... | ..... |

The cubic yards per station for level sections are given to the nearest tenth for every level cut or fill to h = 39.9 ft. Where the ground has a side slope, as is ordinarily the case, then the tables "fall down," for the area must be plotted and calculated in the ordinary way; after which the tables of areas are entered with the area so obtained, and the value of h for a corresponding level section is found; then with this value of h, the tables of cubic yards are entered and the yardage corresponding to the height, h, is found. This yardage, it should be noted, is given according to the prismoid formula, not according to the mean ends formula. Lest any one err, we repeat that the tables of area do not give the area for any but level sections; that is, for ground having no cross-slope, so that practically all areas have to be calculated. Moreover, the tables can be used only for three-level sections, that is, for cross-sections where rod readings are taken only at the center and at each slope stake, giving the factors h, r, and l.

Trautwine's "Excavation and Embankment Tables and Diagrams" (5½ × 9 ins.; pp. 60; $3) give the cubic yards per station for level sections up to h = 60.9 ft. for the following arguments:

| b = | s = | | | | | |
|---|---|---|---|---|---|---|
| 14 | ..... | ..... | ..... | ..... | 1½ to 1, | ..... |
| 18 | ⅛ to 1, | ⅛ to 1, | 1 to 1, | 1½ to 1, | 1½ " 1, | 2 to 1 |
| 28 | ¼ to 1, | ⅛ to 1, | 1 to 1, | 1¼ to 1, | 1½ " 1, | 2 to 1 |

The nearest even cubic yard is given, tenths being dropped except for values of h under 9 ft. There is also a table giving the cubic yards to the nearest tenth, corresponding to any even area up to 1,000 sq. ft., but as this table does not give directly the cubic yards corresponding to an area of say 90.3 sq. ft., it is not so handy as that of Cross and Frost, below mentioned. The diagrams are used in connection with the yardage tables for level sections, and serve to give the height of a corresponding level section. To do this a slope

level or clinometer must be used to ascertain the side slope of the ground. For preliminary work this might do, but for final location, where slope stakes are set, this method is never employed nowadays.

Howard's "Earthwork Mensuration" (6 × 9 ins.; pp. 72; $1.50) contains a table giving the cubic yards per station corresponding to every area of cross-section up to 400.9 sq. ft., the areas being to tenths and the cubic yards to tenths. This is a very useful table, and a similar one is found also in Cross's Field Book, below mentioned. In addition there is a table of level cuttings (up to h = 100.9 ft.) giving the even cu. yds. per station (no tenths except up to h = 11 ft.) for the level cross-sections having the following arguments:

| b = | s = |
|---|---|
| 14 | 1½ to 1. |
| 16 | ½ to 1, ⅛ to 1. |
| 18 | 1 to 1. |
| 22 | 1½ to 1. |
| 28 | ½ to 1, ⅛ to 1. |
| 30 | 1 to 1. |

In addition there is a small table for the height of level section corresponding to different areas, but the table is wholly inadequate, involving too much multiplication. There are also small tables for reducing to prismoidal formula values. This book has all the limitations of Rice's tables, above given, beside many of its own.

Pullen and Chandler's "Excavation and Embankment Tables," (7 × 10½ ins.; pp. 60; $3) includes tables giving the cubic yards per lineal ft. (instead of per station of 100 ft. as usual), for level sections for each tenth of cut or fill up to h = 30.9 ft., the cubic yards being given to four decimal places, for cross-sections having the following arguments:

b = 12, 14, 16, 18 and 20,

with any value of

s = ¼ to 1, ⅝ to 1, 1 to 1, or 1½ to 1.

For ground sloping crosswise these tables contain a correction factor which is multiplied by (1 + r ÷ 2 h). For three-level sections we thus get the cubic yards according to the averaging end areas formula, but to find the correction where the prismoid formula is used, there is a large folding table, containing a factor corresponding to $h_1 - h_2$ in the horizontal column, and $d_1 - d_2$ in the vertical column. These tables are thus very useful for three-level sections where the arguments are as above given.

Warner's "Tables and Diagrams for the Computation of Earthwork" (7 × 10 ins.; pp. 315; $4) are somewhat like Trautwine's. They are based upon a measurement of the center cut and the cross-slope of the ground in degrees with a clinometer, which is now so uncommon a method that we shall give but brief space to them. In addition to a very full set of yardage tables wherein the factors are the center cut, the cross slope, and the side slope of the cut itself, there is a table giving the yards of rectangular prisms for all cuts up to 120.9 ft. and for all widths in even feet up to 9 ft.

Broadbent and Campin's "Earthwork Tables" (7½ × 5 ins.; pp. 54; $2) give the cubic yards per station correspond to all cuts or fills up to 80.5 ft., progressing by tenths, for each 1 ft. of width of prism having a rectangular end. The volumes are given according to the prismoid formula. Then to find the volumes corresponding to the two side triangles of a fill or cut, there is a column of factors which must be multiplied by the slope (s) and added to the volume of the center rectangular prism. By themselves these tables are ordinarily valueless, since they are applicable only to level sections, that is, sections on perfectly level ground.

Hazen's "Railway Contractor's Hand-Book" (5 × 6 ins.; pp. 138; $2) contains tables for level sections for cuts up to h = 35.9 ft., for all even widths of road bed (b) from 10 to 32 ft. (excepting for odd numbers like b = 11, 13, 15, etc.) and for slopes, s = ¼ to 1, ½ to 1, 1 to 1, 1¼ to 1, 1½ to 1, 2 to 1, 3 to 1. There are no correction tables, therefore these tables are of no value to the engineer except for making very rough monthly or preliminary estimates. For contractors desiring to make rough estimates of yardage, however, the book is very handy. Moore's "A Table for Irregular Cross-Sections" (6 × 10 ins.; pp. 31; $1.50) differs from all preceding tables in giving yardage per station corresponding to triangular areas. The triangular "arguments" are the base or width and the height of the triangle which are taken from the plotted cross-section. The table gives the cubic yards per station to tenths for all triangles up to a base width of 60 ft. and a height of 30.9 ft., the base width being to even feet and the height to tenths of a foot; thus for a base of 60 ft. and a height of 24.9 ft. the cubic yards from the table are 1,383.3. Since all cross-sections are divisable into triangles this table is evidently applicable to any cross-section. The table is obviously very useful for irregular cross-sections.

Cross and Frost's "Engineer's Field Book" (5 × 7 ins.; pp. 166; $1) contains an exceedingly useful table, giving the cubic yards to the second decimal place for any area from 0 to 350.0 sq. ft., direct, for 100 ft. stations. Since the cubic yards are given to hundredths, the table can be used with accuracy for areas ten times as large by moving the decimal one place to the right. If used in connection with a table giving areas of triangles or trapezoids (there is none such in print) irregular sections could be calculated with great rapidity. Many engineers prefer to plot all cross-sections, which becomes absolutely necessary where rock and earth occur in the same section, or where the section contains more than five rod readings. In such cases either Moore's Tables, or these Cross and Frost Tables, used with a table of triangle areas, best meet the requirements.

Hudson's "Tables of Excavation and Embankment" (6 × 9 ins.; pp. 90; $1) are so arranged that

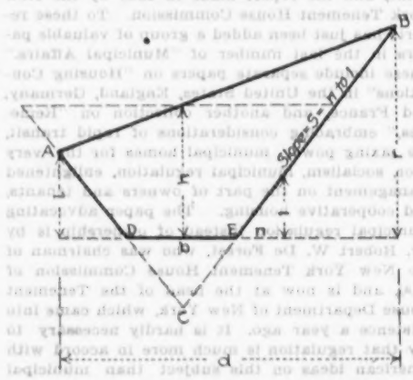


Diagram Showing Arguments Used in Tables.

on one page the cubic yards per station are given for every tenth of foot fill up to h = 50.9 ft. of a level section, while on the opposite page is given the corresponding plus or minus correction for side sloping ground. Thus for r = h = 21.1 ft., the correction is + 53.9 cu. yds. These tables are most excellent for three-level section work, even in side sloping ground, where the averaging end areas formula is used, but they are confined to widths of roadbed and side slopes as follows:

| b = | s = |
|---|---|
| 10 | 1½ to 1. |
| 14 | 1½ to 1. |
| 14 | 1 to 1. |
| 18 | 1½ to 1. |
| 20 | ¼ to 1, 1 to 1. |
| 24 | 1 to 1, 1½ to 1. |
| 26 | 1½ " 1. |
| 28 | ¼ to 1, 1 to 1, 1½ " 1. |

In order to use the prismoid formula with Hudson's Tables it is necessary to plot the mid area, find the cubic yards corresponding in the table, multiply by 4, add to the yardage corresponding to the end sections and divide by 6.

Crandall's "Tables for the Computation of Earthwork" (6 × 9 ins.; pp. 42; $1.50) resemble Moore's, above mentioned, in that they give cubic yards per station for a triangular base. The greatest triangle whose corresponding volume can be found in the table is one with a width of 100.9 ft., and a height of 50.9 ft. The cubic yards given are to the nearest unit, tenths being dropped. For all practical purposes this is close enough. The yardage given in the main tables is according to the averaging ends formula, but there are supplementary tables by means of which additive corrections can be made so as to give results according to the prismoid formula for three-level section work, without plotting the mid area as with Hudson's Tables.

Crandall's table is superior to Hudson's, where the prismoid formula is to be used, but inferior where the means ends formula is used for any width of roadbed and slope that Hudson has tabulated.

Crandall is inferior to Moore in that with Crandall a separate additive correction must be made for each tenth of fill, whereas Moore gives cubic yards direct; but Crandall is superior to Moore in having a correction table to use in cases where the prismoid formula must be applied.

Johnson's "Stadia and Earthwork Tables" (6 × 9 ins.; pp. 100; $1.25; also in the back of Johnson's Surveying; ($4), are modeled somewhat after Crandall, but are designed to give the cubic yards according to the prismoid formula, at once, instead of by first giving the yardage according to the averaging ends formula and afterward applying a correction. They are especially adapted to three-level sections, but may be used with five-level sections, or even with irregular sections, since the volumes given correspond to triangular bases. We are of opinion, however, that wherever more than five rod readings are taken on a section, the best way to compute volumes is first to find the partial areas of triangles and trapezoids, add to them, and apply some such table as that of Cross and Frost. Therefore Johnson's, Crandall's, and Hudson's tables find their greatest usefulness in three-level section work, and to a less degree in five-level section works. The factors or arguments used in Johnson's tables are the distance apart of the slope stakes, which is given up to 100.9 ft. and the center cut plus a constant for the given roadbed and side slope up to 50.9 ft. This evidently gives the cubic yards per station for a triangular prism A B C (see figure), from which a constant yardage corresponding to C D E must be subtracted. The mid area is not plotted, but its arguments are found by taking the mean of the end arguments. The table gives the nearest cu. yd., tenths being dropped. Some engineers prefer it to Crandall, others do not.

From the foregoing review our correspondent will see that there are no tables giving areas for different widths of roadbed and slopes where the ground has a side slope.

## CORRESPONDENCE.

### Books on Railway Train Brakes.

Sir: What would you recommend as the best book (American or English) on the theory and practice of railway train brakes? If possible, I would also like prices and dates of publication. Yours very truly,

S. Hattori.

Goethestr. 14, Charlottenburg, Dec. 12, 1902.

(One of the most satisfactory books on air brake work is the "Air Brake Catechism," by Mr. R. H. Blackall, air brake inspector of the Delaware & Hudson Canal Co. It was first published in 1898, was revised in 1900, and is now in its fifteenth edition. It is a well-bound volume of about 250 pages, and sells for $1.50. The catechism form has been adopted for most of the books on air brakes, and one of the best of these is the standard examination questions and answers on the air brake formulated by the Air Brake Association at its eighth annual convention in 1901. This contains 135 pages and is sold for 25 cents. Another excellent little catechism is that of Mr. C. B. Conger, published in 1900, and now in its sixth thousand. This is got up in handy pocket-book form for 75 cts in cloth, or $1 in flexible leather.

A recent book which aims at elementary treatment and to make the air brake mechanism comprehensible to even the dullest student has been recently brought out by Mr. Frank H. Dukesmith, Superintendent of Air Brake Instruction on the Texas & Pacific and International & Great Northern railways. It is sold at $1.

Among older books on the air brake we may note "Air Brake Practice" ($1), by J. E. Phelan, formerly a Division Superintendent of the Northern Pacific R. R., which was first brought out in 1890.

and two books by Mr. Paul Synnestvedt, of Chicago, "Diseases of the Air Brake System" ($1), published in 1894, and "Evolution of the Air Brake" ($1), published in 1895.

All these books are thoroughly practical manuals, and all describe the Westinghouse automatic quick action air brake, which is the standard in American railway practice. They are intended principally for the instruction of engine runners, trainmen, repair-shopmen and other employees who have to do with the handling of brakes. For more advanced information covering the problems involved in the design of the air brake, reference should be made to the published proceedings of the Master Car Builder's and Master Mechanic's associations, the Railway clubs and the files of technical journals.

Before leaving the subject note should be made of the old standard English work on "Continuous Railway Brakes," by Michael Reynolds, published in 1882. Nowhere else that we now recall is an extended historical account of the early "battles of the brakes" to be found. The book is still in print and is sold at $3.60.—Ed.)

## Monographs on Tunnels.

Sir: In the Engineering Literature Supplement to Engineering News of Dec. 18, 1902, Mr. C. K. Conrad, asks for a list of standard works on tunnels. I note your reply to his query. In this connection I would like to call his attention to a monograph entitled "The Vosburg Tunnel; Lehigh Valley R. R.," and issued in 1887, by Leo von Rosenberg, 35 Broadway, N. Y. ($1.00.) This monograph is a complete history of the tunnel in question, and contains a good deal of valuable information. Engineering News, for the past few years, contains a number of articles on this subject, which if collected might make a useful volume. In most of the articles, one main item seems invariably to be neglected, and that is that of actual cost. It is to be regretted that in large works of this kind, an accurate account of the contractor's force is not kept, together with other expenditures, from which the unit cost of various classes of work could be deducted. There usually seems to be a lack of interest in obtaining this information; in fact, many engineers consider it a waste of time and energy to do so, contending that a knowledge of the contract price is sufficient information. Of course, the keeping of an accurate force account and the compilation of this data is to some extent an extra expense, but I think the value of the facts obtained more than counterbalance any pecuniary objections.

Respectfully,
Emile Low, M. Am. Soc. C. E.
Buffalo, N. Y., Dec. 22, 1902.

(There are a number of monographs on specific tunnels, but our first correspondent wished comprehensive treatises on tunneling. The foregoing remarks on costs are only too true, and apply to all branches of engineering. There are, however, a growing number of engineers who keep records of detailed costs, but for various reasons, some of which are quite obvious, even though not always justifiable, they keep the figures themselves.—Ed.)

## Literature on the Dangers of Grade Crossings.

W. A. M., Toronto, Ont., desires a book in which information is given regarding the difficulties and dangers involved in grade-crossings of railways and highways.

There is no book devoted to the subject of grade crossings, but more or less information may be found in the reports of State Railroad Commissions, particularly in the Massachusetts reports. The subject is treated briefly in both Zeublin's "American Municipal Progress" and Baker's "Municipal Engineering and Sanitation" ($1.25 each.) A number of special reports on the elimination of grade crossings have been made in behalf of the cities of Buffalo, (1888), Newton, Mass. (1893), Worcester, Mass. (1898 and 1899), Cleveland, O. (Chamber of Commerce, 1900), Cambridge, Mass. (1901), and Newark, N. J. (1901?).

A paper and general discussion on "The Abolition of Grade Crossings in Massachusetts" was published as recently as the November number (1902) of the "Journal of the Association of Engineering Societies" (35 cts.) In the same publication, for December, 1899, there is a discussion of the respective rights of various parties interested in grade crossings. In the "Century Magazine" for May, 1898, there is quite a lengthy article on "Railway Crossings in Europe and America." Progress in the removal of grade crossings in Chicago is reviewed from year to year in the annual reports of the Department of Public Works of that city, Chicago being notable for the large amount of this class of work done and under way, all practically without expense to the city.

The same correspondent desires "a standard work in which is freely discussed the influence of dams, piers or other obstructions upon the direction and volume of current in large rivers." Can our readers suggest any source of information on this subject?—Ed.)

## Railway Frogs.

Sir: Will you please recommend a good practical book on the subject of frogs. In particular would like good illustrations and formulas in reference to the solutions of frog angles, under various conditions.

Respectfully yours, Chas. Thumiger.
1605 Rose St., Philadelphia, Jan. 1, 1903.

(There is no book on frogs exclusively, but the construction of frogs and switches and the laying out of turnouts (involving frog work) are treated in most books on railway track. In Tratman's "Railway Track and Track Work" ($3) there is a chapter on switches and frogs, and another on switch work and turnouts. These include tables of frog angles, leads, and radii of turnout curves, and a discussion of the principles of frog work, with formulas. The "Trackman's Helper" ($1.50) also has a chapter on Frogs and Switches. There is a good book on "Switch Layouts" by the late Mr. Torrey ($1) and one by D. H. Lovell on "Practical Switch Work" ($1). "Standard Turnouts on American Railroads" ($1) consists of 20 diagrams of turnouts, with dimensions and brief particulars.—Ed.)

## Recent Technical Dictionaries and Trade Glossaries.

Sir: Can you furnish me with a list of the new technical dictionaries and trade glossaries which have been published during the last ten years? If you have facilities for doing this and can give me this information I shall be much obliged.

Very truly yours, Benjamin E. Smith,
Editor "Century Dictionary."
33 East 17th St., New York city.

(The following technical dictionaries have been published or revised within the last ten years: Sloane's "Standard Electrical Dictionary" (New York, 1902, and third edition, 1897, $3); Houston's "Dictionary of Electrical Words, Terms and Phrases" (New York, 1889, and third edition, 1894; $7, and also a pocket edition, $2.50); Lockwood's "Dictionary of Mechanical Terms" (Joseph G. Horner, editor; London, third edition, 1902; ($3). Sturgis' "Dictionary of Architecture" (New York, 1902; $18, net). Glossaries are given in the engineers' pocket-books of Trautwine, Haswell, and Kidder (New York, $5, $4 and $4, respectively), and in "Practical Electricity" (Cleveland, O., 1901, $2).—Ed.)

## Comments and Suggestions Relating to the First Issue of the Supplement.

Sir: I think the Engineering Literature Supplement is a move in the right direction. If the primary object of the book review, as stated in your issue of Dec. 18, is strictly adhered to, the supplement alone is worth the subscription price of Engineering News to a practicing engineer. When not at work I am studying, and at present I am studying Philbrick's "Engineer's Pocket Book," and in my humble opinion it is the best one out. But suppose I am mistaken? Then I am not reading the best, and am making a very bad mistake for a practicing engineer who has not more than three months out of the year to study. One of the objects of the Supplement is to prevent just such mistakes. Again, a gentleman recently bought Trautwine's "Pocket Book," sixteenth edition. Had he been a reader of the Supplement he would have bought the last edition.

Last, but not least: I contemplate buying the last edition of Wolcott C. Foster's "Wooden Trestle Bridges," but am not certain that it will pay me, for perhaps the same ground is sufficiently covered by the new edition of Trautwine—I have the sixteenth edition and do not wish to buy both the new Trautwine and Foster. I would like to see a review of this book in the Supplement, if not asking too much. Respectfully yours,

Cephas Holmes, City Engineer.
Macomb, Ill., Dec. 22, 1902.

(Foster's "Wooden Trestle Bridges," third edition, was reviewed in Engineering News for Jan. 24, 1901. The review closed with the following statement: "The new chapters distinctly improve the book and make it more than ever the best treatise in print, probably, on the subject to which it is devoted." The new edition of Trautwine is reviewed elsewhere in this issue. Obviously the consideration given to a single kind of bridges in a pocket-book is very small compared with that given in a treatise of 250 large pages, devoted exclusively to that one subject. But in choosing between the two books one should not forget that the latest edition of the pocket-book contains new and re-written matter on a variety of subjects.—Ed.)

A correspondent has called our attention to the fact that Sanborn's "Five-Hundred Problems for Students of Mechanics" does not contain answers to all the problems, as was inadvertently stated in the review in our issue of Dec. 18.

## Progress in Municipal Service as Seen by a Professor of Sociology.

**AMERICAN MUNICIPAL PROGRESS.—Chapters in Municipal Socialism. By Charles Zueblin, Professor of Sociology in the University of Chicago. New York: The Macmillan Co. Half leather; 5 × 8 ins.; pp. 380; tables. $1.25 net.**

This rapid but interesting and suggestive survey of municipal sociological progress in the United States should prove quite as helpful in showing how municipalities have failed as in portraying their successes in supplying the collective needs of their citizens. After an introductory chapter, in which municipal sociology is discussed and a composite ideal municipality is sketched by selecting the good points from the practice of many cities, the author devotes successive chapters to transportation, public works, sanitation, schools, libraries, buildings, parks and boulevards, recreation, and public control, ownership and operation.

While we heartily commend the book as a whole, we are compelled to say that it contains a number of errors and misleading statements. We propose to devote more space to these than their own importance warrants in order to call general attention to the need of exercising more care in verifying statements of alleged fact, and in avoiding broad generalizations from limited data, particularly when such large and technical subjects are treated as make it necessary to take much of the information at second hand.

To begin with bridges: The author says suspension bridges at Chicago are "out of the question" because so many bridges are necessary there, but the real reason is that suspension bridges are uncalled for and impracticable under the conditions prevailing in Chicago. A jack-knife bridge is said to be a popular name for a rolling-lift bridge, but in fact the two terms denote different types. The Washington bridge over the Harlem River in New York city is characterized as "doubtless the most beautiful cantilever bridge in the country," but it is a steel arch bridge instead of a cantilever. Boston and New York are cited as instances of cities which "have begun the use of salt water for fire protection," which is very misleading if not entirely untrue for New York, even after the author qualifies his statement, later on, by speaking of "the success of this system in protecting high buildings" in the latter city. Perhaps equally misleading is the mention of the Boston subway as an example of municipal provision for underground pipes and wires.

The section on the disposal of garbage fails to make clear the difference between the cremation and reduction processes, and conveys no idea of the relative extent to which each is used. After stating that at Cleveland "the garbage is destroyed in furnaces," which is not the case, the author proceeds to give a partial description of the reduction plant actually in use. The description of the separation of wastes in New York, under Colonel Waring, conveys the idea that sorting by Italians on the dumping scows was abandoned for refuse-sorting plants at the docks,

whereas only one small, isolated experimental refuse-sorting plant was built, and the refuse taken to that consisted of waste paper, rags, and other dry material, collected apart from the ashes and garbage. The function of this plant was to sort all salable material into classes, leaving the relatively small amount of worthless residue to go to a furnace, not mentioned by the author, there to be utilized in the production of steam to furnish power to operate the mechanical portion of the plant. A similar, but larger and permanent plant, has been in operation in Boston for a number of years, but it is barely mentioned in a foot note, and that in such a way that no one not familiar with the subject would realize that it is an extension of the principle involved in the New York experimental plant. Similarly, when discussing garbage and waste disposal in New York the author does not even hint at the fact that the contractor serving that city has the largest garbage reducion plant in the world, but in a foot note further along it is stated that the "Arnold Process" is used in New York. All this is confusing enough to persons not already posted, and exasperating to those who are. Feeding garbage to swine at Taunton, Mass., is described as "nearly self-sustaining," but it is not stated that the sanitary results of such a practice are probably so bad as to more than outweigh any revenue derived therefrom.

Speaking of garbage cremation, the author says:

> There seems to be no reason why a compactly-built, well-paved (American—Ed.) city might not enjoy such economy as is observed in Shoreditch, London, where the household refuse in the Dust Destructor and Electric Lighting Station consumes itself without the need of fuel and at the same time furnishes light for the community and heat for the public baths, laundry and library.

Such statements as these do more harm than their authors realize, leading many a city official, and an occasional city, far astray. It is true that some, at least, of the heat for the Shoreditch public baths, laundry and library is furnished by the refuse destructor, but the latter merely contributes a portion of the heat required to produce the steam for the electric lighting plant. The financial relations between the refuse destroyer and electric light scheme are concealed by the accounts of the borough; or at least they were not made at all clear in the early reports, evidently through a desire to make the cost of electric lighting appear as low as possible. So much for conditions at Shoreditch. When an American engineer tries to apply here the results obtained there, even if they were clearly set forth, he is confronted by the fact that the English refuse, and particularly that of Shoreditch, is quite unlike the refuse which the American cities send to their garbage furnaces, but as to just what the difference is he cannot be certain, owing to the lack of reliable comparative figures.

The popular fallacy that sewage may be readily made a source of revenue is given further currency by this book, which even goes so far as to declare that

> the problem of Chicago's sewage disposal is not yet solved and there is reason to believe the additional cost of disposing of the solid matters in the sewage could be met by their separation through familiar processes and sale as fertilizing materials.

To hold out to American municipalities a general promise of revenue from sewage farming is bad enough, but to talk seriously of sludge utilization on an immense scale is far worse.

The absurdly low death rate of 1.5 per 1,000 claimed by Marion, Ia., is not even questioned by the author, further than to state that "this phenomenal record" is attributed by Cedar Rapids to the use of its hospitals by Marion. An expenditure of $2,500,000 for a water filtration plant at Philadelphia, the reader can only infer, is to provide a daily capacity of only 6,000,000 gallons; and to a man employed by a local paper to make a report for its columns is given the credit of "an investigation into Philadelphia's needs, which resulted in an appropriation of $12,000,000 for a filter plant." It is no discredit to the man in question to say that he had nothing whatever to do with the engineering studies which led to the adoption of the plans now being carried out at Philadelphia for a series of filter plants, one of which alone will have a daily capacity of 200,000,000 gallons. In another place, New Jersey is mentioned as a State which "has appointed a commission to investigate" the pollution of water supplies, while in fact its legislature several years ago created a State Sewerage Commission with very full statutory powers to deal with the subject. Ohio is credited with having "attempted a regulation of this abuse," whereas it long ago gave its State Board of Health power to veto unsanitary plans for sewage disposal. The pioneer work of Massachusetts in the same line is not mentioned. The terms "smoke consumption" and "waste of smoke" are used in a way not in accord with either the technical or economic principles involved in smoke prevention. One of the most sweeping statements in this book, and one that will both interest and amuse New Yorkers, is that "it required only a few examples" of the anti-spitting ordinance, with its penalty of $500, "to put an end to the filthy practice" of spitting in public places in that city. Finally, although the author states "that some municipal magazines maintain their existence largely by the subsidies of paving companies" (which we do not question), he lays himself open to wholly unwarranted suspicion by giving a fine advertisement to a proprietary process used in paving work.

## An Elementary Book and a Scientific Treatise on Forestry.

FIRST BOOK OF FORESTRY.—By Filibert Roth, Chief of Division of Forestry, U. S. Department of the Interior. Boston: Ginn & Co. Cloth; 5½ × 7½ ins.; pp. 291; 98 illustrations. 75 cts.; by mail, 85 cts.

ECONOMICS OF FORESTRY.—A Reference Book for Students of Political Economy and Professional and Lay Students of Forestry. By Bernhard E. Fernow, L.L. D., Director of the New York College of Forestry, Cornell University. New York: Thomas Y. Crowell & Co. Cloth; 5 × 8 ins.; pp. 520; tables. $1.50 net; by mail, $1.65.

Until quite recently American contributions to the literature of forestry have been confined almost wholly to government reports, society proceedings and magazine articles. But 1902 may be considered a red letter year in the annals of American forestry, for during its course there appeared Gifford's "Practical Forestry" (see this supplement for Dec. 18, 1902), Roth's "A First Book of Forestry," and Fernow's "Economics of Forestry." The first, notwithstanding its modest sub-title, "A First Book of Forestry," was a fairly comprehensive review of the subject. The second, by Roth, is even more elementary than Gifford, but in its humbler and perhaps wider field promises to be equally successful. The third book named is a scientific treatise, written from the economic viewpoint, and while it seems likely to have a narrower it may be expected to have a deeper influence than the other books. All three are needed, and we trust that they may be given the welcome they so richly deserve. Certainly they appear at a most opportune time, when the imperative need of forest conservation and development is beginning to be widely felt, and when the blood of healthy men is being stirred anew with the love of all things out-of-doors.

Mr. Roth states in his preface that besides the instruction in forestry given in two special schools in this country, elementary courses "are given in several colleges and preparatory schools." He has attempted to meet "a desire" for the introduction of "this useful and interesting study into our public schools and country homes" by presenting "in simple, non-technical language some of the general principles underlying the science, and to state the methods which are employed and the objects to be atained in the practice of forestry." To this task the author has brought "early association with the well-kept forests of Germany, observations made in the widely differing forest districts of our own country and three years' experience in teaching forestry," the latter as assistant professor of forestry at Cornell. The author first takes his readers, in imagination, into the forest itself, describing the wildwoods, and the relation thereto of light and shade, soils and moisture, heat and cold. The second and main division of the book is devoted to the different methods of raising trees, protecting them from fire, insects, and wind, and of utilizing the trees for timber, resin, turpentine, seeds, and other purposes. Under "Related Topics" the forest as a protective cover is described, the character and distribution of American forests are outlined, the structural features, physical and chemical properties of wood are set forth, and instructions for distinguishing common trees are given. An appendix contains a log scale table of circles and a descriptive "List of the More Important Woods and Trees of the United States." Numerous half-tones and a fair number of drawings add greatly to the easy understanding of the text. The type is large and clear and an index is provided.

Turning now to the "Economics of Forestry" it may be said, in passing, that probably no authority on forestry is better known to American engineers than Mr. Fernow, the author of the book in question. The author states in his preface that there is not, so far as he knows, "any book in the English language which atempts a full and systematic discussion of the subject" of forestry as it is treated in the present volume, which discusses "not only the things which directly interest the economist," but also contains "a more or less comprehensive exposition of the technical detail of the foresters' art," thus enabling one to judge the conditions governing the practice of the art.

This combination of the economics and the art of forestry in one volume, or rather the method in which it has been carried out, is the only adverse criticism of the book which we shall offer; and on that point we only wish to say that possibly the book would have been clearer and its teachings more forcible if the art or practice of forestry and the economic principles involved had been more fully separated. But perhaps such a course would have been impossible without altogether too much repetition.

The book opens with a brief survey of "The Relation of the State to Natural Resources," and continues with a consideration of "The Forest as a Resource." Next follow a number of chapters on various phases of forestry, both cultural and economic, after which there is a chapter on the specific subject of forest economy, another on forest policy in general, and still another on "Forest Policies of Foreign Nations." The last two chapters are devoted to the forest conditions of, and the forestry movement in the United States. An appendix of some 80 pages is filled with numerous "notes, tables, and references," designed to "assist in verifying conclusions drawn and give direction to those who desire to study further." A serviceable bibliography makes a fitting conclusion to the book.

Of course Professor Fernow makes it clear, and that by many, varied and forcible illustrations, that the wanton waste of the timber resources of the country should be stopped, whether that waste be due to the ravages of fire, insects, wind, or the lumberman intent only on the present; and of course he makes equally clear the need for intelligent forest culture to replenish denuded lands and to make the most of growths already established. But perhaps he deserves most commendation for his rational attitude towards private interests, particularly those of the individual man or the more or less temporary associations of men in corporations whose interest in a forest are its immediate rather than its remote products. The time element is an essential of systematic forestry, and, although vast improvements over present conditions are possible where the present and immediate future are the chief concern, yet the author rightly lays emphasis on the fact that it is only under government ownership, or possibly under holdings in behalf of large corporations or trusts (in the old sense of the latter word) that we may expect to see the highest economic development of our forests.

## The Production of Turpentine and Resin.

L'INDUSTRIE DES RESINS.—Par Edmond Rabate. Paris: Gauthier-Villars. Paper; 4¾ × 7½ ins; pp. 180; illustrated.

The collection of pine balsam or crude turpentine and its dissociation into oil of turpentine and resin for commercial purposes constitute the

subject matter of this small volume. To cover his subject within the limits of space available, and at the same time avoid technicalities and too great abbreviation for the general engineering reader, placed a heavy task on the author, and he is to be credited, we think, with having solved the difficulties imposed by these restrictions in an exemplary manner. Having said this, a brief enumeration of the successive chapters and their contents will give the reader an adequate conception of the subject matter of the book and the manner in which it is handled.

In the first chapter the author enumerates the principal trees from which crude turpentine is obtained, and describes their geographical location. In France, the main source of turpentine is the *pinus maritima*, and the second chapter is devoted to a description of this tree, its fruit, leaves and wood, the effect upon its life and timber value of bleeding, and its value in France as a source of turpentine. Chapter III. discusses the theory of balsam secretion and flow, and the several methods of bleeding, keeping in view the husbanding of the tree, and the development of its maximum productiveness. In the fourth chapter the mechanical operations of the tapping process and the tools used for performing these operations are described. Chapter V. sets forth the methods of testing the crude turpentine to determine its relative proportions of essential oil and residues or resin. In the next four chapters the author describes the principal methods of distillation practiced to secure the commercial oil of turpentine and the analysis of these oils. The three chapters remaining explain in a similar manner the production of commercial forms of resin and its products. A fairly complete bibliography concludes the volume.

## A French Book on Forestry and Forest Products.

TIMBER.—A Comprehensive Study of Wood in All Its Aspects, Commercial and Botanical, showing the Different Applications and Uses of Timbers in Various Trades. Translated from the French of Paul Charpentier, Expert Chemical Engineer, Assayer of the French Mint, etc., by Joseph Kennell. London: Scott, Greenwood & Co. New York: D. Van Nostrand Co. Cloth; 6½ x 10 ins.; pp. 437; tables and 178 illustrations in the text. $6 net.

Outside of France and countries where similar conditions prevail this book promises to be useful to all wishing a survey of the chief varieties of timber in the world, together with their general distribution and the principal uses to which they may be put. The book also promises to be useful to anyone wishing brief statements regarding forestry in France, and a fairly detailed account of felling and sawing timber by machinery in that country. In addition, there is a wide range of information, some scanty and some detailed, regarding all sorts of forest products and by-products, chiefly as to the processes involved in making those products available. Various processes for the preservation of timber are described, and there is a separate chapter on timber for shipbuilding, paving, mines, railways and other purposes. The author seems to have his subject well in hand, and the illustrations add much to the value of the book, including, as they do, sketches of the leaves and flower or fruit of various trees, some trees in full, and numerous perspective drawings of machines, retorts and the like used in felling and working timber, and in preparing the various products derived from the forest.

Although the English translation of this book was published in 1902 the book itself appears to have been written many years ago. This opinion is based largely on the fact that in several instances statistics for 1888 are given as though they were the latest ones available.

Curiously enough, in his survey of the timber of the various countries of the world, the author confines his remarks on the United States largely to the single State of Maine, the only one mentioned by name.

THE COMING CITY.—By Richard T. Ely, Director of the School of Economics and Political Science in the University of Wisconsin. New York: Thomas Y. Crowell & Co. Cloth; 5 x 7½ ins.; pp. 110. 60 cts. net.

The author of this suggestive little book has long been connected with, in fact was one of the pioneers in, the movement for uplifting the American city. It is gratifying to note that he recently changed the title of this lecture, for such the original of the book was, from "Neglected Aspects of Municipal Reform" to the more hopeful title which it now bears. It still remains, however, an outline of what is needed in the way of municipal reform. Among its many good ideas we may mention the following: The need of a deeper and wider public interest in municipal reform; the greater importance of men than of measures; the value of expert services in engineering and other branches of municipal work; and the growing conception that municipal government is, or should be, "a profession rather than a business."

## The Revised Trautwine.

CIVIL ENGINEER'S POCKET-BOOK.—By John C. Trautwine, C. E. Revised by John C. Trautwine, Jr., and John C. Trautwine, 3d, Civil Engineers. New York: John Wiley & Sons. Leather; 4½ x 6¾ ins.; pp. xxxii. + 1,079; many tables and illustrations. $5.

The first edition of "Trautwine" appeared more than thirty years ago, and it is safe to say that no other work on the general subject of civil engineering has passed trrough as many editions. Although the trained civil engineer of experience has always found, and in this new edition will still find, in "Trautwine," a great deal lacking on the one hand, and much of questionable value on the other, the work undoubtedly possesses great merit or it would have died long ago, instead of reaching its seventieth thousand. When, therefore, we point out later wherein this last edition is disappointing, let it be understood that we do it not with a view of minimizing the true value of the handbook, but rather in the hope of aiding its future betterment. The changes and additions made in the present edition add so much to the value of the pocket-book that one cannot help wishing that the revision had extended from cover to cover. But perhaps that is too much to expect from both the revisers and the publishers; and certainly the users of the pocket-book could hardly have afforded to wait longer for the improvements already available. It is to be hoped that the good work of revision and extension will be continued so that by the end of three to five years we may have a thoroughly up-to-date "Civil Engineer's Pocket-Book."

How sadly in need of revision "Trautwine" had become is partly shown by the fact that while the present edition contains 370 pages of "new matter," the net gain in size is only a hundred pages or so. Every user of the book will be glad to see that the pages have been renumbered, thus eliminating such awkward page numbers as 351a to h.

Of the new matter, the first worthy of special notice is the 36 conversion tables of units of measurement. These tables cover 15 pages, and give not only the conversion factors, but their logarithms. The tables are the most complete and most useful of the kind that we have ever seen.

Following the common conversion tables of length, surface, volume, weight and time, are tables of work and heat, surface per length, volume per surface, length per time (velocity), volume per time (discharge), work per time, value per length, per surface, per volume, per weight, per work and per time, volume per surface per time, and others.

We note a few omissions, such as units of temperature and their equivalents. The units of electric pressure and resistance are also omitted, although the equivalents of the kilowatt are given.

We find under "Surveying," a new isogonic chart and seven new pages on locating a true meridian. Otherwise the part on surveying remains practically as of old, and very much out of date. For example, there is nothing on subdividing a "section" of land, or on relocating lost section corners. In fact one would never know from reading "Trautwine" that by far the greater part of the United States is divided into townships, sections and quarter sections. This probably is due to the fact that the authors are "eastern men." There is little or nothing on road or railway surveying, cross-sectioning or slope staking. In a word, the kinds of surveying upon which so many engineers are engaged are not treated at all, or only in the most perfunctory manner. There are several new pages on rainfall, but the data on evaporation, seepage and runoff remain unrevised.

The section on "Statics" has been very largely rewritten, and is in consequence much improved, especially in the parts relating to arch and dam pressures and moments in beams. But "Friction" remains practically unchanged and very deficient in up-to-date records. We find, for example, the same old tables of Morin, with practically nothing of recent dynamometer tests on rolling friction, or of brake tests on journal friction.

"Strength of Materials" has been largely rewritten, but when we come to "pillars" we find the same old Gordon formula, and nothing about the modern straight line formulas used by bridge designers. "Hydrostatics" and "Hydraulics" remain very much as of old, although susceptible of great improvement. There is a new page on the miner's inch that gives no hint of the fact that there is more than one kind of a miner's inch in use. There are four new pages on the Venturi meter that are commendable, followed by a page on the Ferris-Pitot meter; but there is nothing at all on the Cole photo pitometer (see Trans. Am. Soc. C. E., 1902). Yet on the very next page there is a footnote referring to the Williams-Hubbell-Fenkell paper, in the discussion of which Mr. Cole described his pitometer.

Under "Water Supply" we note a new and useful table giving the cost of trenching and pipe-laying. The estimates given are for the most part well on the side of safety, although there are many places where the excavation and backfilling will cost more than the sums given. The wages of the workers are given, but it is not stated whether for an eight or a ten-hour day. Some figures showing the relation between water pipe mileage and population in Philadelphia in 1885 are still retained, but in pleasing contrast there are some good data on water consumption and waste based on Mr. John R. Freeman's New York studies of 1899. A sentence stating that no galvanic action has been observed where lead or brass pipes join with cast iron is left standing, properly enough, but nowhere do we find a reference to the electrolysis of gas and water mains. A machine for tapping water mains under pressure is described, but no intimation is given that branches many inches in diameter may be inserted in this manner, and there is nothing about pipe-cutting machines for use in trenches or elsewhere. Nearly a half page has been added about a pneumatic dome to prevent the bursting of water pipes from freezing, but there is nothing regarding the much more important recent practice of thawing frozen pipes by means of electricity. An old paragraph on "Ball's patent iron and cement pipe," with the name of manufacturers who, so far as we can find, have not been in business for years, is left standing; but there is nothing to indicate that similar pipe has been made for years by other concerns, and by water departments as well; nor that a large mileage of cement-lined wrought iron pipe has been torn out during the last 10 to 15 years on account of its frequent failure. Wood stave pipe, now so largely used for pipe lines in the West, is not mentioned.

"Stand-Pipes" certainly deserves more than a fourth of a page. Under "Reservoirs" it is stated that "rollers are not to be recommended" for use in constructing embankments, "as they tend to produce seams between the layers." There is no qualification to this sweeping statement, further than the suggestion that "this might possibly be obviated by projections on the circumference of the roller." It is hard to see how the revisers could let these two sentences stand without at least a supplementary statement to the effect that many, if not most, engineers believe in the use of rollers, and that grooved rollers are now frequently used. On sewers and sewage disposal there is absolutely nothing; and if we except half a dozen lines scattered here and there, in which the word sewer occurs, we might infer that sewers do not come under civil engineering.

The matter on "Trusses" is almost entirely new, and very much better than in the older editions.

We note, however, that plate girders are very inadequately treated, having only about a page in all. In this connection it should be observed that a new feature deserving special commendation is the digest of truss specifications, wherein are to be found much useful data.

Tables of structural steel have been revised, and we now find Carnegie shapes where formerly there were out-of-date tables or iron shapes. The part on "Cement and Concrete" has been rewritten, but still remains very unsatisfactory. For example, there is not a word about how concrete should be mixed, or the cost of mixing. Nothing is said about the variation in sizes of cement barrels—indeed we can find no mention of the size of any cement barrel. The strength of concrete is said to be increased 50% by ramming, whereas Rafter's experiments, which are perhaps the most authoritative now, show an increase of only 12% at most. As a matter of fact it seems to us that the rewriting of this part has been a questionable improvement; and we cannot understand how the revisers could have omitted all reference to concrete-steel construction.

Coming to wooden pillars and beams we find the same old tables and formulas that no educated engineer has used since Professor Lanza's experiments on full-sized columns and beams became generally known, a decade or so ago.

Likewise we find the same original and misleading tables of earthwork cost that will continue to add new victims as of old. We still read that for leads of 40 ft. a two-horse drag or slip scraper will move 220 cu. yds. of earth per day, when we know that 70 cu. yds. is about the best ever actually measured and recorded as a day's work.

The book ends with a price-list, business directory, bibliography and glossary, the last named title being very inadequate. The price-list is a move in the right direction, and for rough estimates will often save an engineer much time, but like most tables it must be used with judgment.

Speaking of using judgment, we are reminded of a blunder recently made by a "practical man" who had designed a retaining wall, using "Trautwine" as his authority. He correctly determined the thrust of the earth according to the formula given, but, failing to find anything further on proportioning the wall to resist the thrust, he assumed that he had a factor of safety of 1.5 because the wall weighed 1.5 times the total horizontal thrust! While this illustrates that a little knowledge is truly a dangerous thing, it incidentally shows that this particular part of "Trautwine" also needs revision.

Of course, it is a great task to completely revise any engineer's handbook, and perhaps we have seemed too exacting in reviewing this last edition of a work so voluminous. However, it is needless to say that no other handbook for civil engineers equals "Trautwine," and in a friendly spirit only have we offered the foregoing suggestions for its future improvement.

## The Bacterial Analysis, Quality and Purification of Water.

**AN INTRODUCTION TO THE BACTERIOLOGICAL EXAMINATION OF WATER.—By W. H. Horrocks, Assistant Professor of Military Hygiene, Army Medical School, Netley; Major Royal Army Medical Corps. London: J. & A. Churchill. Cloth; 6 × 9 ins.; pp. 300; 5 plates. $4.20.**

The author has been eminently successful in combining an outline of the technic of the examination of water with a clear exposition of environmental conditions and the interpretation of bacterial analysis. As a consequence the book promises to be valuable to engineers and water-works authorities concerned with the quality of natural water supplies or the output of purification works. The author states his plan so well in his preface that we quote from it as follows:

In this volume I have endeavored to present in a simple form the methods and results of a bacteriological examination of water. The object of such an examination being to discover whether a water is likely to be prejudicial to health, it is obviously necessary to have clear ideas as to the hygienic value of the various micro-organisms which have been isolated from water. Great difficulties have been introduced into the subject owing to the extreme variability of water bacteria. The microscopical appearances of these micro-organisms are largely influenced by the media on which they are growing, and the cultural characteristics are greatly dependent on whether micro-organisms are enfeebled or not. It is also well known that bacteria, which normally inhabit the human body, find in water very unfavorable conditions for their existence; consequently, after a comparatively brief existence in this medium, they often exhibit weakened forms when isolated on ordinary bacteriological media. In order to simplify matters as much as possible, the bacteria which occur in water have been arranged in three classes, viz.: (1) Bacteria which are found in pure water; (2) bacteria which are in common sewage, but rarely met with in pure water; and (3) bacteria which give rise to specific disease in human beings. The micro-organisms in the first class are very numerous, but many of them have been so imperfectly described that it has been very difficult to group them in a satisfactory manner. As the easiest solution of the difficulty, and to facilitate reference, certain well-defined types have been selected, and under each type have been described all those bacteria which are probably varieties, the variations being caused by differences in food, habitat, etc. I have examined nearly all the bacteria mentioned, and the descriptions are taken from observations of pure cultures obtained either from Kral's laboratory or from the original discoverers of the bacteria.

The subject of the bacterial flora of sewage is yet in its infancy, but enough work has been done to enable certain bacteria to be classed as the normal inhabitants of sewage, and I hope this section will assist in the solution of the difficult problems which are often placed before the water bacteriologist.

Of the bacteria which give rise to specific disease in human beings, only the B. typhosus and Sp. Choleræ Asiaticæ occur sufficiently often in water to merit description in a small work. The differential diagnosis of the B. typhosus by the serum test has lately received much attention, and an attempt has been made to summarize the most recent work on the subject.

The plates have been drawn from my own sketches, and the colonies depicted are believed to represent the forms most commonly seen during routine examinations of "water-plates."

After describing the methods of collecting water for examination and the preparation of culture plates, the author reviews the multiplication of bacteria in water and the way it is affected by light, temperature, movement and chemical composition of water. The injurious action of sunlight on bacteria in water

probably extends through water to a distance of about two meters, but undue reliance must not be placed on its bactericidal powers even in shallow streams, as the micro-organisms may be attached to suspended particles, and so protected to a great extent from the action of light.

Under ordinary circumstances it appears from experiments that the movement of water has no appreciable influence on the vitality of bacteria.

The diminution of bacteria in water subjected to sedimentation

may be due to the following causes:

(1) To the death rate of those bacteria which either do not belong to the so-called water-bacteria or are sensitive to the influence of light.

(2) To a sedimentation of non-motile microbes and the spores of motile bacteria.

(3) To a spontaneous sinking of bacteria with solid materials which form nutritive centers.

(4) To a mechanical sinking of bacteria with the subsidence of heavy materials.

As to the effect of the chemical composition of water a review of the evidence

appears to justify the statement that there is no direct and constant relation between the chemical composition and the number of micro-organisms; but, speaking generally, it may be said that those waters which contain much organic matter usually show a high bacterial count.

After summarizing a number of studies of the bacterial contents of water from various sources the author says:

A brief consideration of these results shows that, with the exception of deep wells and springs, it is impossible to decide from the quantitative examination alone whether a water supply has been polluted or not. This is due to the fact that the great variations in the results are attributable not only to the possible sewage contamination, but also to the influence of the physical and chemical conditions of the supply, which operate sometimes so as to increase the number of micro-organisms present, and at other times to lead to rapid disappearance of the micro-organisms. It is also evident that the general standards given by many observers cannot be used for all waters. Macé certainly says that the number of micro-organisms present does not give any accurate information as to the value of a water; at the same time he suggests the following classification, which gives the mean results of a long series of examinations:

| | Micro-organisms (per c. c.) | |
|---|---|---|
| Very good waters contain from..... | 0 to | 50 |
| Good waters contain from..... | 50 " | 500 |
| Mediocre waters contain from..... | 500 " | 3,000 |
| Bad waters contain from..... | 3,000 " | 10,000 |
| Very bad waters contain from..... | 10,000 " | 100,000 |

The only sound way to judge a supply is to examine each source separately at different times of the year, especially before and after rain, in summer and in winter; in this way local standards for comparison will be obtained which will have great practical value. For general reference water supplies may be arranged in the following groups: (a) spring and deep well waters; (b) upland surface waters; (c) shallow well waters; (d) river waters.

Springs and deep wells, the author states, really yield "filtered supplies containing, as a rule, very few bacteria, and he quotes Tieman and Gärtner as setting a maximum limit of 50 bacteria per cu. cm. for such waters. Upland surface waters "may be without filtration," provided they are not "obviously open to pollution from human habitations." If not subject to such pollution such supplies may be studied by bacterial counts of water from the feeders at different times of the year, and also by examining the water at the upper and lower ends of the usual impounding reservoir in order to determine the effect of storage. As to shallow wells, no standard can be fixed, and

Unless properly covered, imperviously stained to a sufficient depth and surrounded by at least one acre of virgin ground, shallow wells must be considered dangerous sources of supply. The number of micro-organisms in water from such a source is also liable to extreme variation from climatic conditions independently of pollution, so that practically local standards are of little value.

Regarding rivers, the author says:

As a rule, they are dangerous sources of supply, for it appears that there are few, if any, rivers which by natural processes can purify themselves sufficiently to justify their consumption without artificial treatment.

In a brief chapter on "The Relation of a Quantitative Bacteriological Analysis to Filtration of Water Through Sand," the author devotes a large part of his space to a review of the Lawrence Experiments of the Massachusetts State Board of Health. He next takes up quantitative bacterial examinations, to which he devotes about 225 pages, in accordance with the general classification of bacteria mentioned in the section of the preface already quoted. The reason for adopting this classification (pure water, normal sewage, and pathogenic bacteria) is worth quoting for its sensible remarks on isolating the typhoid bacillus:

Bacteriologists now realize that the isolation of such an organism as the B. typhosus is a matter of considerable difficulty, and that it can only be accomplished under exceptionally favorable circumstances. Admitting this to be the case, and considering from a hygienic point of view that it is highly desirable, in the absence of the discovery of a specific pathogenic organism, to be able to state that a suspected water has been polluted with sewage, many bacteriologists have recently studied the flora of sewage with great care. As a result of their work a number of organisms have been described which appear to be so characteristic of sewage as to justify the term sewage-bacteria in contradistinction to water-bacteria.

A chapter of 16 pages is devoted to "The Mode of Action and Utility of the Pasteur-Chamberland and Berkefeld Filters." The author first reviews a number of tests by numerous observers on the efficiency of these filters. Before describing his own experiments, he states:

All the experiments hitherto described appear to prove conclusively that typhoid bacilli will not be able to grow through either a Pasteur-Chamberland or Berkefeld filtering candle. Unfortunately, my own work has led me to a different conclusion in regard to the Berkefeld candles.

After describing eleven experiments of his own on the Berkefeld filters, and stating that he conducted similar ones on the Pasteur-Chamberland filters, the author presents the following conclusions regarding both filters:

(1) The B. typhosus is not able to grow through the walls of a Pasteur-Chamberland candle, and, if proper care be taken to prevent the direct passage of organisms through flaws in the material and imperfections in the fittings, the Pasteur-Chamberland filter ought to give complete protection from water-borne disease.

(2) Typhoid bacilli can grow through the walls of Berkefeld candles, the time required for the passage being largely dependent on the nutriment supplied to the organisms by the filtering fluid. The large size of the lacunar spaces in the Berkefeld candle, which cannot be avoided if a fair delivery is to be obtained, appears to militate against the immobilizing and devitalizing influences which operate so strongly in filters made with very narrow lacunar spaces. It is well known that the typhoid bacillus can grow out into long thread-like forms and if this takes place in the lacunar spaces of the Berkefeld candle, the bacillus may find its way into the interior of the candle. It is also probable that, owing to deficient immobilization the bacilli are generally washed through the filtering candles. This often takes place when filters are worked with a pump bearing directly on the bougie; if, however, an air cavity is introduced between the pump and the filtering candle, the pressure is equalized and this source of danger is removed.

(3) When a highly polluted liquid containing typhoid bacilli is filtered through a Berkefeld candle the bacilli may appear in the filtrate in four days. Consequently in order to obtain protection from water-borne disease, when these filters are employed, it is necessary to sterilize the candles every third day. This cannot be done by simply brushing the candles, they must be sterilized by boiling water or by exposure to saturated steam.

This interesting chapter is concluded by a section on methods of testing household and laboratory filters for both the direct and the indirect passage of bacteria through the filters.

A summary of the methods recommended for

bacterial water analyses and for the preparation of nutrient culture media, followed by a brief bibliography, conclude the book.

## Professor Howe's New Book on Wood and Steel Roof Trusses.

SIMPLE ROOF TRUSSES IN WOOD AND STEEL.—By Malverd A. Howe, M. Am. Soc. C. E., Professor of Civil Engineering, Rose Polytechnic Institute. New York: John Wiley & Sons. Cloth; 6 × 9 ins.; pp. 124; illustrated. $2.

This new book by Professor Howe will be welcomed by engineers particularly for the information and instruction which it gives for designing timber roof trusses. There are now many books which give ample information for designing and constructing steel roof trusses, but one has to search a long time and through many volumes to obtain similarly complete and simple information respecting wooden roof truss design. It is with no intention of disparaging the treatment of steel roof truss design given by Professor Howe that we make these remarks; their purpose is simply to point out what seems to us to be the most useful feature of the book before us and the feature for which the average engineer will purchase it. It is oftentimes too glibly assumed that the timber truss is an out-of-date structure for which engineers have no further use. This is a grave error so far as roof truss construction is concerned, and there are yet places and conditions where bridge trusses of timber have a legitimate claim for adoption instead of steel structures.

Referring more specifically to the contents of the little book which Professor Howe has prepared, the first two chapters give a concise introduction to the elements of graphical statics, taking the subject far enough to enable the reader to understand and solve such problems as arise in calculating the stresses in simple roof truss forms. A chapter on strength of materials follows, which contains data and formulas for determining the strength of wood and steel members in compression, shear and flexure, and for determining the crushing strength with and across the grain of abutting timbers. A short chapter relating to and giving data for roof covering, wind loads, sizes of commercial shapes in timber and steel and of bolts and rivets, gives, with the various tables at the end of the volume, all needful data for the design of simple trusses in steel and wood. The tables given are taken for the most part from the various steel-makers' pocketbooks. In Chapter V., the author discusses in detail the design of a timber roof truss of 60-ft. span and 20-ft. rise. The stresses in the several members are first calculated graphically, and then the design of each member to take the load coming upon it is considered. Each joint or connection is treated separately and for each, several possible forms of joints are discussed, figured in detail and illustrated by dimensioned drawings. About 40 pages are given to this discussion and they contain, as we have already stated, the choice meat of the book. Chapter VI. treats briefly the design of a steel roof truss.

## A Practical Book on Stereotomy.

STEREOTOMY.—By Arthur W. French, Professor of Civil Engineering, Worcester Polytechnic Institute, and Howard C. Ives, Instructor in Civil Engineering, Worcester Polytechnic Institute. New York: John Wiley & Sons. Cloth; 6 × 9 ins.; pp. 115; illustrated. $2.50.

While there is no great lack of literature which may be classed as coming directly or indirectly under the heading of stereotomy, such special text-books in English as there are were written and published many years ago, and, therefore, fail to give practical examples of modern masonry structures, even if they attempted to illustrate the actual works of their own day. It is to remedy that deficiency in previous books that this one has been written. No claim is made by the authors for originality in text, their aim having been to select matter from older works, to condense where possible, to add explanations where it was deemed necessary, and to bring together matter which was previously scattered through many works, in order that a useful text-book might be made available to students and teachers. The task which they thus set before themselves has been, we think, well performed. The text is clear and concise and the subject matter covered appears to include about everything that the engineering student needs to know to enable him to meet all the requirements in this special branch of knowledge for which his future work is likely to call.

Taking up the several chapters in order, we find in Chapter I. a general discussion of building stones, quarrying, stone-cutting tools, stone-cutters' finishes, classes of masonry, and various useful definitions of the technical terms used in masonry work and stone-cutting. This chapter is in substance a digest of the detailed presentation of the same information in Baker's "Masonry Construction" and Merrill's "Stones for Building and Decoration," but while it contains nothing new, it furnishes, easy to access, the information which the student of the succeeding chapters may happen, through forgetfulness or lack of familiarity with the larger and better works, to need for a clear understanding of their terminology. In Chapter II. the subject matter of stereotomy proper begins to be considered by a description, first, of the necessary drawings of the entire structure and its parts; second, of the directing instruments used in cutting plain and other surfaces, and of the proper order of applying these instruments, and third, of methods of making plaster casts of cut stone forms. We note here that the authors urge the benefit to students of actually cutting from blocks of plaster some of the stone forms called for in the book, using the directing instruments described. Chapter III. states and then solves in detail problems involving plane-sided structures, such as a buttress, a bridge pier and abutment and architectural stonework. Chapter IV. is a similar treatment for structures having developable curved surfaces such as plain, groined and cloistered arches, descending or rampant arches, and curved bridge piers. As practical examples for this chapter the arch bridges at Elyria, O.; Schenley Park Pittsburg, Pa.; and Pelham, N. Y., are described and illustrated. In Chapter V. the oblique, or skew arch, including the "false" skew, the ribbed skew, and the skew with spiral courses, are fully discussed. In Chapter VI. three special problems are given: The recessed Marseilles gate, the hemispherical dome, and the geometrical stairway. These problems, like that of the spiral curved skew arch, are of very infrequent occurrence in practice and about all that can be said in favor of their consideration in any text-book is that they furnish mental training to the student. A feature of the book is the convenient bibliography of special articles and books given at the ends of several of the more important sections. There is a short but adequate index, and the illustrations are generally good.

## An Elementary Work on Mechanical Drawing.

A MANUAL OF DRAWING.—By C. E. Coolidge, Assistant Professor of Machine Design, Sibley College, Cornell University. New York: John Wiley & Sons. Paper; 6 × 9 ins.; pp. 172; illustrated. $1.

This is a manual of instruction in the technic of mechanical drawing, designed for students in engineering, and particularly for beginners in the drafting room. To suit the purpose stated the treatment is made as simple and elementary as possible, for it is intended that the book shall take the place of a great part at least of the usual informal oral instruction given to the student by his teacher. It is no simple task to meet these requirements, and we think that when all things are considered the author has met them very satisfactorily, and has produced a book of instructions which every beginner in drawing will be benefited in having at hand for consultation.

Part I. treats of drafting materials and instruments. The various drawing papers, tracing cloths, printing papers, etc., are named and described, and their manipulation, care and suitability to various purposes are discussed in detail. Pencils and inks are similarly considered, and all forms of drafting instruments are described and instructions given for their selection, care and manipulation. Part II. takes up the subject of commercial mechanical drawings, and gives explicit instructions for practically every detail of the rendering of such drawings. This section of the book is illustrated by several plates of sample drawings and lettering alphabets, all of which we regret to say are of a rather indifferent character. The book has a good index, and is also made easy for reference by marginal headings. The text is printed on one side only of the leaf, the opposite side being left blank for notes.

## Concrete-Steel Construction.

LE CIMENT ARME ET LES APPLICATIONS.—By Marie-Auguste Morel. Paris: Gauthier-Villars and Masson et Cie. Paper; 4½ × 7½ ins.; pp. 152; illustrated.

This little volume contains a succinct account of the theory and practice of concrete-steel construction as it has been developed by European engineers of the continent. Its key-note is simplicity, and to maintain this note the author has shown little mercy to the lubrications of the "savant" when they have interfered with his purpose. Such drastic methods will perhaps disappoint a few strenuous souls who can revel in controversy and mathematics of the European brand, but they will gain warm gratitude from the American engineer who seeks to know, and that quickly, what his European brethren are really accomplishing toward a working theory and practice in concrete-steel design. Altogether the book contains less than 150 pages of text, but there is compressed within this space in unusually readable form a large amount of information.

In his introduction the author outlines briefly both the early history of concrete-steel construction and its development in recent years. The first real public appearance of the combination of concrete and steel in the form which has since become familiar to all engineers dates back to the Paris Exposition of 1855, when Lambot exhibited a boat constructed of this material. In 1861 Francis Coignet enunciated the principles involved in concrete-steel construction, and proposed several methods of applying this construction to the building of plates, arches and conduits. Joseph Monier was, however, the first to take out a patent covering a form of concrete-steel construction. This patent was secured in 1865, and related to the construction of garden pots and vases. These patents were exploited in Germany by the Actiengesellschaft für Beton und Monierbau of Berlin and in Austria by a company directed by Wayss. In America and England the author credits Hyatt, Jackson and Ransome as being the first to apply concrete-steel construction to actual use. In France the first application of concrete and metal in combination was made at the port of Toulon, in 1876. Such construction did not came to extended notice, however, until the Paris Exposition of 1889, when Bordenave and Cottancin exhibited several specimens of their work. In 1892 the systems of Hennebique and of Edmund Coignet were developed. Since that time the number of systems to be developed has been very large.

Mr. Morel points out that the theory of concrete-steel construction has not kept pace with its use. He refers, however, to the creditable work of Considere, Christophe, Lefort, Resal, Harel de la Noe, and others, and sums it up by saying that while it has not furnished all that might be desired by the engineer it has developed many instructive results. An interesting bit of information is that the French Department of Public Works has appointed a commission to fix the conditions under which concrete-steel systems of construction will be permitted in works of public character. In concluding his introduction, Mr. Morel enumerates the various objections which have been brought against concrete-steel construction, and states that they have all been met and proven unimportant by the test of experience.

In the first chapter of his book the author outlines the theories of concrete-steel construction which have been promulgated by Christophe, Lefort, Considere, Harel de la Noe and Resal. He gives preference to the theory of Christophe because of its simplicity and sound hypotheses based on experience. This chapter is largely mathematical, and is rather formidable, despite the fact that care has been taken to make it as clear and simple as possible. In Chapter II. the prin-

cipal systems of concrete-steel construction are classified and described. In Chapter III. the character and quality of the materials used in concrete-steel construction are discussed. In some respects the information contained in this chapter is the most practically valuable of any which the author gives. The book closes with a chapter setting forth the methods of calculation practiced by the inventors of various systems, including those of Hennebique, Coiquet, Matrai, Bonna, Boussiron, Coularou, Giros-Loucheur, Pavin de Lefarge, Degon, Bordenave, Cottancin, and Societe de Creches. Preference is given to the theories and systems of construction which have been developed by French engineers, and because of this the usefulness of the chapter is not so great as it would be had it been less exclusive of the work of engineers of other nationalities. It is hardly fair, however, to quarrel with an author for what he does not attempt, particularly when that which he does attempt is so well done as it is in the book before us.

## The Conclusion of an Elaborate German Treatise on Railway Track.

RAILWAY TRACK.—By A. Haarmann, General Director of the Georgs-Marien Bergwerks und Huetten Vereins. Third volume. Leipzig: Wilhelm Engelmann. Cloth; 4to; pp. 277; 503 illustrations.

This volume completes Mr. Haarmann's elaborate treatise on railway track, the first two volumes of which were published some years ago. The present volume is devoted largely to the discussion of the wear of rails, wood and steel ties, bolts, spikes, splice bars and other track appliances, and is properly illustrated by engravings showing the wear, corrosion, splitting and distortion which result from actual service. It has often been assumed that the broad-based cast-iron chairs used to support the English bull-head rail prevent injury to the wooden ties, but the illustrations show that this is by no means the case. A great variety of methods of track construction are described and illustrated, and detailed tables of the weights of the constituent parts are given. These descriptions lead up to a form of construction designed by Mr. Haarmann, with special regard to strength and stiffness at the joints. He uses an unsymmetrical rail, having the web set to one side of the center line of the head; at the joints the heads are planed away on one side so that the rails can be scarfed or halved, with the webs lying side by side and bolted together with the splice bolts. Long angle splice bars with vertical flanges below the rail base are used, and spliced with six bolts. The rail ends rest on a cast-steel bridge plate resting on the two joint ties, and extending to the full depth between them. This is made to fit the ties accurately, whether of wood or steel. This construction has been in use for about two years on the line between Hamburg and Cologne, which carries many fast trains, and it is said to have given very satisfactory results. It is now proposed to introduce the system into this country. The weight of track with 80-lb., 50-ft. rails, steel ties and base plates, splices, bolt fastenings, etc., complete, is about 425 lbs. per yd. The book is excellently printed, and all the illustrations are well executed wood cuts.

## Light Railways from a British Viewpoint.

LIGHT RAILWAY CONSTRUCTION.—By Richard Marion Parkinson, Assoc. M. Inst. C. E. London and New York: Longmans, Green & Co. Cloth; 6 × 9½ ins.; pp. 244; 85 illustrations in the text. $4.

A light railway is one of essentially simple and cheap construction, designed for economy in cost and operation. Railways of this kind may be divided into two classes: (1) Those intended as auxiliary or feeder lines in countries already having main lines of railway, and (2) those intended for the development of new countries. The work which we have under review deals with light railways of the first class in England alone. The high cost of construction of English railways, and the enormous expenditures of time and money in the legal or parliamentary preliminaries, are pretty well understood, and until within very recent years England would have been the last place in which one would have expected to find anything in the way of cheap construction. In his introduction, however, the author points out that with a view of extending railway communication to agricultural and other districts which are not rich enough to pay a fair return upon the cost of such railways as are usually constructed in that country, an Act of Parliament was passed in 1896 authorizing the construction of light railways. Unfortunately the author does not go on to show the workings and effects of the Act, or what has been accomplished under its provisions.

A glance through the book suffices to show that the term "light" is relative and indefinite, for the character of construction outlined for English light railways appears decidedly substantial and costly. The roads are, however, light as compared with ordinary English railways. A few pages are devoted to brief descriptions of the features of foreign and colonial railways, but there is no reference to the extensive use of light railways in European countries. About three pages are given to American railways, but the author makes the common mistake of assuming or implying that all American railways are of light construction.

As to the vexed question of standard or narrow gage, the author believes that the transhipping of freight is not as serious as it is often assumed to be, but on the other hand the saving due to a narrow gage is felt only in the bridges, ballast and ties. If the line is not made strong enough to take the ordinary rolling stock, however, he thinks that there might as well be a break of gage. Curves of 10 or 20 chains (660 to 1,320 ft.) radius are practicable where the speeds are not high, and in the matter of grades the author believes in short heavy grades (on which the trains will be divided) rather than in long developments to secure easy grade. Light railways in England nearly always require fencing, and different styles are described.

Earthwork is next considered, and the elaboration of style and construction described make it evident that even a light railway, in England, is a serious proposition. Tile drainage for cuts, and slopes trimmed, soiled and seeded, are among the items. Scraper and grader work seems to be unknown, shoveling by hand and transportation by wagon or single dump cars being the only methods described. The design of rails is gone into at some unnecessary length, and there is little said about the weights required, although rails of 14 to 84 lbs. per yd. are mentioned. Steel ties are said to be more suitable for light than ordinary railways. Bridges and culverts include masonry structures only, with the exception of a steel footbridge for crossing the track at stations. Tunneling is considered in unnecessary detail; as even an English light railway would avoid the costly and difficult tunnel work here described, including that for underground railways.

In the matter of stations we begin to see a little simplicity in design, but all the structures shown have masonry walls. Signals are required at passing places. The chapter on drainage and water supply includes notes on rainfall, quality of water, and the sewerage and drainage of houses and stations. A chapter on steep inclines briefly describes the cable system for street railways, the Abt rack-rail system, and the Fell grip-rail system. Gas, compressed air, and electric traction are briefly described in the same chapter, but there is nothing to show that electric traction is being applied to light railways. The next two chapters discuss contracts, specifications, measurements and estimates, with forms for bills of quantities. The chapter on preparation of the plans required by Parliamentary regulations is rather staggering to the engineer who regards a "light" railway as a simple proposition. Appendices to the book give the requirements as to plans and sections, the Board of Trade rules relating to light railways, estimates for track and buildings, and a form of concession for a light railway.

We have gone thus fully into a description of the character of the book and of the work of which it treats in order to give our readers some idea of its very limited scope. To an engineer practicing in England the book may be very useful, but we cannot imagine that it could be of practical value outside of that country.

In its style and its contents the book is inferior to "Light Railways at Home and Abroad," by William Henry Cole (Philadelphia, 1889). This latter is of very much larger scope, to be sure, but instead of simply describing various features of construction, it is full of actual figures and definite information respecting both the subject in general and various individual lines. In his chapter on light railways in England, Mr. Cole discusses the history and progress of the light railway movement, and deals with certain lines of this class in such a way as to give a good idea of the character of construction and equipment, the cost, results obtained, and other information. He also presents the relation between railways and light railways as classed in England. Mr. Parkinson is content to deal more largely in generalities concerning individual features of the construction and works, as already explained. His book is printed in large type, and its illustrations, while not very artistic, have at least the merit that the dimension figures are large and legible. There is a table of contents but no index.

LETTERING FOR DRAFTSMEN, ENGINEERS AND STUDENTS.—A Practical System of Freehand Lettering for Working Drawings. Eighth Edition, Revised and Enlarged. By Chas. W. Reinhardt, Chief Draftsman, Engineering News. New York: D. Van Nostrand Co. Boards; 11 × 8 ins.; pp. 34; 12 plates and over 50 illustrations in the text. $1.

Besides numerous minor revisions the present edition of this book has been enlarged by adding a brief section on titles for drawings, with two new plates, and also by adding text and a plate showing what a vast amount of lettering may be placed on a detailed drawing and yet permit the drawing to be greatly reduced in the photo-engraving and still leave the lettering "sharp and clean cut, even under a magnifying glass."

ANCIENT AND MODERN ENGINEERING AND THE ISTHMIAN CANAL.—By Wm. H. Burr, M. Am. Soc. C. E., Professor of Civil Engineering in Columbia University. New York: John Wiley & Sons. Cloth; 6 × 9 ins.; pp. 473; tables and illustrations. $3.50 net; postage 27 cts.

In his preface the author states that this book is the outcome of a course of six popular lectures delivered in the winter and spring of 1902 at Cooper Union, New York, under the auspices of Columbia University. It seemed desirable to the President of the last-named institution that the subject matter of these lectures should be prepared for ulimate publication and the lectures were therefore suitably expanded for this purpose. The subjects of the six lectures and of the corresponding "parts" of the book, with the number of pages of the book devoted to each, are as follows: Ancient Civil Engineering Works, 70 pages; Bridges, 108 pages; Water-Works for Cities and Towns, 142 pages; Some Features of Railroad Engineering, 70 pages; Isthmian Canals, 83 pages. Only a few of the many branches of engineering, it will be seen, are touched upon at all, and of these the treatment, both because of the limited space available and because of the necessity of giving a popular form and character to the original lectures, is necessarily brief and general. The book, however, while meeting more particularly the demands of the lay reader, is by no means devoid of interest to the engineer. The 83 pages, for example, which are devoted to the Nicaragua and Panama canals are concise and accurate statements of the history of these two great enterprises; of the physical characteristics of the country traversed, and of the works of construction planned. The special student of Isthmian canal problems will ever, of course, go to the original reports for his information, but for the general reader, and here we include the majority of engineers, we do not know of a more satisfactory and useful short account of the Nicaragua and Panama canal projects than is found in the book before us. The same statement is not quite true perhaps of the other subjects treated, but they are nevertheless handled within the limits imposed by space and audience with good judgment and a full knowledge of the latest thought and research. Despite these merits no bridge engineer will make the mistake of expecting a complete technical treatise on bridge engineering in 108 pages, nor

will the hydraulic and sanitary engineer expect to find the broad subject of water-works for cities fully treated in all its ramifications in the somewhat greater space allotted to that complex subject. Beyond these statements the book does not call for explanation to engineers. It is typographically good and is well illustrated, but it is because of the kind of paper used, and it is without an index. The latter defect is only partly excused by a very complete list of contents.

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WATER SUPPLY AND IRRIGATION PAPERS OF THE U. S. GEOLOGICAL SURVEY.—Chas. D. Walcott, Director. Washington, D. C.; Pub. Docs. Paper; 6 × 9 ins.; illustrated.

No. 56: Methods of Stream Measurement.—Compiled from various reports and letters of instruction. Pp. 51; tables, 12 plates and 4 figures.

Nos. 57 and 61: Preliminary List of Deep Borings in the United States.—By N. H. Darton. Part I., Alabama to Montana. Pp. 90; tables. Part II., Nebraska to Wyoming. Pp. 67; tables.

No. 58: Storage of Water on King's River, California.—By J. B. Lippincott. Pp. 101; tables, 32 plates and 2 figures.

Nos. 59 and 60: Development and Application of Water near San Bernardino, Colton and Riverside, Cal.—By J. B. Lippincott. Pp. 141; tables, 11 plates and 14 figures.

Nos. 61 and 62: Hydrography of the Southern Appalachian Mountain Region.—By Henry Albert Pressey. Pp. 190; tables and 44 plates.

No. 64: Accuracy of Steam Measurements.—By Edward Charles Murphy. Pp. 99; tables, 4 plates and 30 figures.

No. 72: Sewage Pollution in the Metropolitan Area near New York City and Its Effect on Inland Water Resources.—By Marshall Ora Leighton. Pp. 75; tables, 8 plates and 4 figures.

Both the Geological Survey and those who make use of its voluminous publications are to be congratulated on the separation of these Water Supply and Irrigation Papers, and their comparatively prompt publication in convenient form. The plan adopted makes it possible for a person to get the specific paper desired without a mass of other printed matter of little interest and no use, and aids greatly in classifying and cataloguing or indexing a library. The convenience of the series would be still further increased if the statutory limit of 100 pages to a paper were modified so as to make it unnecessary to split one paper into two parts. It is possible, however, that more good than harm comes from the limitation, since it doubtless aids materially in preventing undesirable expansion of the papers.

The first of the papers listed (No. 56) describes briefly the methods employed by the government observers in making weir, and more particularly, velocity measurements. Weirs, floats, current meters, gaging stations and their appurtenances are described, together with the care of instruments, the rating of meters and the making of notes and computations. Tables for computing results for publication are also included.

Professor Murphy's paper on the "Accuracy of Steam Measurements" supplements and might almost displace No. 56. It is a valuable addition to engineering literature. It not only discusses the accuracy of steam measurements, but also describes the instruments and methods employed, reviews the experiments of others, and gives the results of recent experiments by the author at the hydraulic laboratory of Cornell University. The latter include experiments with float rods and the current meter and with the current meter and weir. Price and Haskell current meters were employed by Professor Murphy.

The papers on deep well borings (Nos. 57 and 61) more or less completely cover the whole country, representative wells being taken where many are found in one locality. All the borings included are more than 400 ft. deep. The tables give the depth, diameter, yield per minute, height of water and various remarks on the success and output (water, oil or gas) of the well, and the observed temperatures. There is a bibliography for each State.

The first (No. 58) of Mr. Lippincott's three papers is on the possibilities of storage of water on King's River, California, and includes estimates for dams, electric power developments, and the transmission of electric power and its use for pumping water. The other two papers by the same author describe and discuss in an interesting and instructive way what has actually been done in the development and use of water in one of the most notable irrigated districts of the world.

The two papers (Nos. 62 and 63) by Mr. Pressy on the "Hydrography of the Southern Appalachian Mountain Region" are general studies of the physiography, geology, climate and precipitation, and natural resources of portions of the States of Virginia, North and South Carolina, Tennessee, Georgia, and Alabama, together with more or less detailed descriptions of the various main streams and their important tributaries, including, in some instances, discharge measurements.

Mr. Leighton's paper (No. 72) on "Sewage Pollution" is unique and suggests a wide range of possibilities for future investigations. It is devoted to the Raritan, Passaic and Hudson Rivers, and their tributaries, thus involving a wide range of interests in the three States of New Jersey, New York and Massachusetts. The various streams are described, figures on their yield are given, and their value for water power and water supply, and their relations to the ice and fish industries and real estate interests are taken up, all in their relation to pollution by sewage. In the case of the Passaic River the following summary is given:

> We have seen that the natural resources of the Passaic system are very extensive, embracing water power, water supply, ice fields, fisheries, transportation and natural scenic advantages, but that all but one of these have been so damaged by pollution as to produce the following results:
>
> (1) Abandonment of three water supply intakes and the establishment of three others, at a total expense of not less than $20,000,000.
>
> (2) Extensive decline of power values because of inadaptability of water for use in boilers and in manufacturing processes.
>
> (3) Loss of annual harvest of ice weighing 10,000 tons.
>
> (4) Absolute destruction of fisheries in lower valley.
>
> (5) Impairment of realty values, the extent of which cannot be too highly estimated in view of the fact that similar properties in clean localities have been made of immense value.

A fair criticism of Mr. Leighton's paper is that it contains far less specific information regarding pollution than would be expected.

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NATIONAL MUNICIPAL LEAGUE.—Proceedings Eighth Annual Meeting, Boston, May 7 to 9, 1902. Clinton Rogers Woodruff, Editor. Philadelphia: National Municipal League. Cloth; 6 × 9 ins.; pp. 357. $1.

INSTRUCTION IN MUNICIPAL GOVERNMENT IN AMERICAN EDUCATIONAL INSTITUTIONS.—Committee Report, Presented by Thomas M. Drown, Chairman, at the Boston meeting of The National Municipal League. Philadelphia: National Municipal League. Paper; 6 × 9 ins.; pp. 24.

HARRISBURG'S ADVANCE: A LESSON TO SMALLER MUNICIPALITIES.—By J. Horace MacFarland. Paper; 6 × 9 ins.; pp. 16; illustrated. Philadelphia: The National Municipal League.

The proceedings of this society never fail to record much of the best thought and work of the year in the interests of a high ideal of municipal administration. The present volume contains the usual broad and suggestive review of "A Year's Municipal Progress," by Mr. Woodruff, and also the usual papers reviewing the general situation, or some special problems or occurrences, in a number of cities. Besides these contributions there are more general papers on vital municipal isssues and two reports of standing committees. The "Committee on Uniform Municipal Accounting," through Dr. E. M. Hartwell, chairman, reports on the work of the year, including a series of schedules for uniform statistics of receipts and expenditures, classified by subjects.

What we trust will prove to be of great service is the report of a Committee on Instruction in Municipal Government in American Educational Institutions. Dr. Thos. M. Drown, of Lehigh University, is chairman of this committee. The report is accompanied by a syllabus for a course of study on municipal government, prepared by Prof. Samuel E. Sparling, of the University of Wisconsin, and by a syllabus for a course of lectures on "American Municipal Progress," by Prof. Chas. Zueblin, of the University of Chicago. Professor Sparling's syllabus is accompanied by numerous references to books and periodicals, but his detailed section on "Public Works and Sanitation," includes no specific references to the literature of water supply, sewerage, street paving, street cleaning and garbage collection and disposal.

It may be added that Dr. Drown's report includes a brief paper by Dr. John Quincy Adams, of Philadelphia, on "Municipal Art as a Subject of Study in School and College," and a list of lecturers, with their subjects, on topics relating to municipal government.

Mr. Macfarland's paper tells how a few citizens of Harrisburg, through a Civic Club and a League for Municipal Improvements, raised $10,222 by subscription; employed Mr. Jas. H. Fuertes, M. Am. Soc. C. E., of New York, to report on sewerage improvements and water purification, Mr. W. H. Manning, of Boston, to formulate a plan for parks, and Mr. M. R. Sherrerd, M. Am. Soc. C. E., of Newark, to report on paving; and, by a campaign of education, secured a popular vote authorizing bonds to the amount of $1,090,000 for the improvements just named. Mr. Macfarland points out that should the citizens of New York subscribe in like proportion to a fund for promoting municipal improvements a total of $700,000 would be available.

Mr. Macfarland's paper, without the illustrations, and Dr. Drown's report, are also included in the proceedings.

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STATISTICS OF CITIES.—Bulletin 42, U. S. Department of Labor, Carroll D. Wright, Editor. Washington, D. C.: Department of Labor. Paper; 6 × 9 ins.; pp. 170; many tables.

This is the fourth annual presentation of statistics of cities of 30,000 and upwards, collected and compiled under the direction of Colonel Wright. The subjects included may be summarized as follows: Population, area, and dates of years (by departments) covered for each of the 137 cities included; vital statistics; fire departments and losses; parks, streets, sewers, street railways, street lighting, garbage, and other refuse, schools, libraries, charities, and building permits; cost of water, gas and electric light plants owned by municipalities; classified summaries of receipts and expenditures; debt and debt limit, assessed valuations and taxations and assets. The various classes of statistics enumerated are given, often in detail, for each of the 137 cities. The addition of summaries and possibly of a few averages, would further extend the usefulness of this mass of statistical information, provided the work was judiciously done by men chosen on account of their intimate practical knowledge of the various subjects treated.


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BACTERIAL TREATMENT OF CRUDE SEWAGE.—Fourth Report on Experimental Treatment of London Crude Sewage. By Prof. Frank Clowes, Chief Chemist to the London County Council. London: P. S. King & Son. Paper; 8 × 13 ins.; pp. 150; tables. $1.20.

The experimental work at the two main outfalls of the sewerage system of Greater London are second in length of the time covered to no other such studies of sewage purification except those of the Massachusetts State Board of Health. The London studies were begun in 1898 and concluded in 1901, extending through three full years. They appear to have been made with great care, and the several reports are valuable additions to the literature of sewage purification. This report reviews the whole period of work briefly, and goes into detail for the period not already reported on. It also contains a summary, in the form of brief notes, of information from municipalities employing bacterial methods of sewage treatment, and over a hundred pages (not closely printed) of tables "Respecting the Bacterial or Natural Treatment of Sewage at Various Centers Throughout the Country." Professor Clowes' own conclusions and recommendations occupy only a page of the report. The experiments show, he believes, that sedimentation, followed by filtration through coke, will give a final effluent that will not undergo offensive putrefaction, even in hot weather, and that will support the respiration of fish. He thinks the coke will not disintegrate after use, that the beds will not clog, and that they will have a permanent sewage capacity, per filling, of 30% of their total volume.

BEITRAG ZUR KENNTNISS DES SOGENANNTEN BIOLOGISCHEN VERFAHRENS, insbesondere die bei der Herstellung und dem Betriebe biologischer Abwässerungsanlagen zu beachtenden allgemeinen Gesichtspunkte. By Dr. K. Thumm. Paper, 6 × 9 ins.; pp. 31. Berlin, 1902.

This pamphlet is a reprint from the "Mittheilungen der Königlichen Prüfungsanstalt für Wasserversorgung und Abwässerbeseitigung" for 1902. It is not essentially a presentation of anything new, but it deals with the general considerations, or "points of view" as the author expresses it, which govern the design and operation of sewage purification plants. It brings together the most advanced knowledge and views in this line, and the author takes a definite position on all points of doubt, giving his reasons for doing so. In particular, some new experiments made by the author to settle some of these doubtful matters are described. Thus, a series of experiments was made on the importance of the nitric acid contents of the effluent from the "oxidation-body," as indicating the degree of purification produced by that body. Dr. Thumm concludes that the nitric acid is no criterion whatever. Other experiments were made on the value of different materials for the makeup of the contact bed. It was found that the percentage of iron in the chemical composition of the material was of great importance on the qualitative effect of the bed, while the degree of porosity affected the quantitative results. He therefore recommends primarily slag, coke or brickbats, containing 1 to 1.5% of iron. Another series of experiments covered the effect of size of grain. He concludes that diameters of 3 to 8 mm. for the secondary bed and 8 to 25 mm. for the primary bed, give the best results, a fair degree of uniformity in each size being also important. The last section of the pamphlet treats of some of the more important constructive features of the basin containing the oxidation body.

MILK IN RELATION TO PUBLIC HEALTH.—The Necessity for the Enactment of Senate Bill Entitled "A Bill to Regulate the Production and Sale of Milk and Cream in and for the District of Columbia." Senate Document 441. By Geo. M. Kober, M. D., Chairman of the Committee on Legislation, Medical Society of the District of Columbia. Washington, D. C.: Pub. Doc. Paper; 6 × 9 ins.; pp. 235; tables and 15 plates.

So far as we know this is the most comprehensive and valuable study of the sanitary aspects of the milk supply that has ever been made in this country. It not only discusses the subject indicated by the title, but also describes methods of milk inspection and analysis. It contains a reprint of Pearson's "Market Milk, a Plan for its Improvement," and of the reports of the milk commissions of the Philadelphia Pediatric Society and the Medical Society of the County of New York. There is a bibliography of 164 entries, and descriptive tables of 195 epidemics of typhoid fever, 99 of scarlatina, and 35 of diphtheria, all attributed to contaminated milk.

BUILDING AND ENGINEERING TRADES DIRECTORY OF THE CITY OF NEW YORK, 1902-3.—Containing Complete Lists of the Architects, Engineers, Builders, Contractors, and all other Professions and Trades identified with the Construction Interests, together with Manufacturers and Dealers in all kinds of Materials, Apparatus and Supplies Used in the Construction, Furnishing and Equipment of Buildings and Engineering Projects. Supplemented by an Alphabetically Arranged Index of all the Names Appearing Under the Trade Classifications. New York: The F. W. Dodge Co. Cloth; 7 × 10½ ins.; pp. 452. $2.

The names under each classification are arranged alphabetically by boroughs. It might add greatly to the convenience if the index to all names in each borough had been consolidated into one index for the whole city.

AMERICAN STREET RAILWAY ASSOCIATION.—Report of the Detroit Meeting, 1902. T. C. Pennington, Secretary, 2020 State St., Chicago. Paper; 6 × 9 ins.; pp. 343; illustrated.

This is a complete report of the proceedings of the 21st annual meeting, held at Detroit, Mich., Oct. 8 to 10, 1902. The papers, committee reports, and discussions occupy about 220 pages. The principal titles are as follows: "Steam Turbine Engines;" "Signals for Urban and Interurban Railways;" "Electric Express and Package Delivery;" "Registration of Transfers;" "Street Railway Benefit Associations;" "Adjustment of Damage Claims;" "Discipline of Employees by the Merit System." The illustrations include the standards adopted by the association in regard to grooved rails, axles, journal bearings and boxes, wheels, and brakeshoes.

THE VALUE OF STREAM GAGINGS.—Suggestions as to the Manner of Applying this Data for the Determination of Power. By John W. Hays, M. Am. Soc. C. E. Broadside; 12 × 20 ins. Reprinted from the "Manufacturers' Record" for Jan. 10, 1901. Address the author, Petersburg, Va.

The author illustrates his subject by means of a table showing the daily gage record of a river station for one year and another table in which the gagings for the same station and year are classified by stream heights, and the corresponding figures given for volume of flow, effective head, gross horse-power thus available and other figures bearing upon the power which might be developed under the conditions shown. The possibilities of auxiliary steam power are also worked out. In addition to the study just outlined Mr. Hays briefly discusses the application of the gagings at one point to other portions of the same stream. A portion of this paper was printed in Bulletin 47, Water Supply and Irrigation Papers, U. S. Geological Survey.

PARK IMPROVEMENT PAPERS.—A Series of Seventeen Papers Relating to the Improvement of the Park System of the District of Columbia; Printed for the Use of the Senate Committee for the District of Columbia; Edited and Compiled by Charles Moore, the Clerk of that Committee. Washington: Pub. Doc. Half leather; 6 × 9 ins.; pp. 282; illustrated.

This interesting and instructive collection of papers includes one by the editor on "The Parks and Their Connections," an old "Essay on the City of Washington," reprinted from the Washington "Gazette" for Nov. 19, 23 and 26, and Dec. 7, 1796; a "Paper Relating to the Trees, Shrubs and Plants in the United States Capitol Grounds," by Frederick Law Olmstead; and two papers on plans for Washington City by Mr. Glenn Brown.

The "Monist" for January, 1903 (Chicago: The Open Court Publishing Co.), contains the first of a series of articles on "The Philosophical Foundations of Mathematics," by Dr. Paul Carus, the editor of the magazine named. The present article is a historical introduction to the subject, ranging from Euclid to the present century. In the same magazine there will also be found a continuation of a "Sketch of the Origin and Development of Geometry Prior to 1850," by Dr. G. Loria, of the University of Genoa, and a seven-page review of Hilbert's "Foundations of Geometry," prepared by Mr. Oswald Veblen, of Chicago.


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ELECTRICAL TESTING IN PHYSICS AND ELECTRICAL ENGINEERING.—Being a Course Suitable for First and Second-Year Students and Others. By G. D. Aspinall Parr, Assoc. M. Inst. E. E. London and New York: Longmans, Green & Co. Cloth; 6 × 9 ins.; pp. 392; 231 illustrations. $2.50.

As is suggested by the sub-title, this book is a laboratory manual for students in electrical physics, and does not attempt to include "commercial" or practical electrical testing. The experimental work which is comprised in the course is the investigation of the fundamental electrical quantities. Where a number of methods are available, as is nearly always the case, they are taken up in separate experiments, to the effect that the student may form an adequate idea of their relative suitability for different purposes. After the description of each experiment suggestions are made as to how the results of the experiment may be used to work out minor inferences or corollaries. A separate division of the book, entitled "Solution of Inferences," is devoted to farther elaborating these suggestions. It should be said that of the nearly 400 pages of text, only a little over half are given up to the actual description or outlining of the experiments, and about 40 pages to the subsidiary matter just mentioned. An important section of the book is a description of the various standard pieces of apparatus used in the experiments, which are illustrated with half-tones, and, where necessary, with sectional drawings. This section seems valuable, not only because it gives fully and compactly matter which in other books of this class is handled in a skimpy way, but also because this matter is segregated so it does not burden the description of the experiments themselves. The final chapter gives some tables that are required in connection with the calculation of the experiments.

The main portion of the book, the manual proper, is arranged in a very concise and orderly manner, and seems to have much instructional capacity. One thing gives rise to some regrets, however: That in each experiment we find a short list giving specifically the apparatus required. This is undoubtedly a help to the slow student, and also expedites the laboratory work; but where the student must scheme out for himself what materials and instruments he should use to build up his testing combination, and must watch for errors that the apparatus may introduce, he gets a training that nothing else gives, and that is often worth much more than the direct knowledge obtained from experimenting. The lists of apparatus as given in Mr. Parr's book are one means by which the student avoids this extra training and easily falls into mechanical ways of working in which his inventiveness and his foresight take no part. It must be admitted, however, that Mr. Parr only follows the prevailing custom in this, and further that many college laboratories are forced to adopt this and other methods to enable them to handle the number of students that offer themselves for the work.

TRAITE PRATIQUE DE TRACTION ELECTRIQUE.—By L. Barbillion and G. T. Grifisch. Paris: E. Bernard et Cie. Paper; 8 × 11 ins.; pp. xvi. + 752; tables and 544 illustrations.

This large book, which appears to be the first volume of a much larger treatise, begins with some remarks on projecting electric railway lines and ends with a chapter on "Traction Motors and Electric Equipment." About 70 pages are devoted to different forms of boilers, furnaces, engines, cooling towers and other details of power stations. Since such equipment has not been developed or greatly modified to meet the demands of electric traction, and is exhaustively treated elsewhere, why should it be discussed at so much length here? This question seems especially pertinent, since the treatment here given is very sketchy. That wrong ideas are easily conveyed in thus attempting to give, as it were, a survey of the mechanical side of central stations, is exemplified in a page devoted to chimneys, and illustrated by a drawing of a brick chimney. Here it is stated that steel-plate chimneys, which are sometimes built, have several disadvantages, principally that their high heat conductivity cools off the ascending gases and thereby increases the amount of smoke!

The electrical work, to which the main part of the book is devoted, is quite fully treated, though little that is new or particularly interesting is given. It is, of course, largely a compendium of apparatus and methods of applying them, with descriptions and illustrations of the apparatus predominating. Different types of apparatus and forms of construction adopted in different cases are listed and very briefly described, but there is only rarely an adequate comparison of different types as to relative adaptability for different uses. For instance, while a number of pages are devoted to trolley-wire line construction, no clear idea is conveyed of what represents good modern practice in this work.

An attempt has been made to give a fair representation to American practice, which would seem advisable, particularly because America has led and now leads in the development of electric traction. However, the book is so little an exposition of what is considered best electric railway practice in this country that Americans will probably consider it of value mainly as presenting the European side of the case. The choice of matter and of extent of treatment is not a happy one, and much might be mentioned that has been neglected altogether; for instance, the general subject of car equipment, or the matter of brakes, or of signaling equipment of the line. But in view of the nature of the work, and of the fact that a second volume is intended, it seems unprofitable and possibly unfair to take up such matters in detail.

We would suggest that in the second volume greater pains be taken to arrange the topics more logically, thus adding greatly to the ready use of the book. This lack of logical arrangement, it may be added, is a not uncommon fault in technical books, particularly where they consist largely of compilations.

LOCOMOTIVE MECHANISM AND ENGINEERING.—By H. C. Reagan. New York: John Wiley & Sons. Cloth; 5 × 7½ ins.; pp. 578; illustrated. $2.

The first edition of this book was fully reviewed in Engineering News of April 19, 1896. Since that time a second and third edition have been printed and sold, and the volume before us represents a fourth edition, in which the contents have been still further revised and added to. The new matter of the present edition includes information on liquid fuel and oil burning locomotives, on valve motions for compound locomotives, and on metallic packing and air pumps.

A COUNTRY WITHOUT STRIKES.—By Henry Demarest Lloyd. With an Introduction by William Pember Reeves, Ex-Minister of Labor in New Zealand, and Author of the Compulsory Arbitration Law. New York: Doubleday, Page & Co. Cloth; 5 × 7 ins.; pp. xiv. + 183. $1 net.

The country is New Zealand, and the absence of strikes from 1895 to 1900 is attributed to the boards of conciliation and the appellate court of arbitration which came into force in 1895. Conciliation or, in case that fails, arbitration, is compulsory in all industries in which there are trade-unions registered in accordance to law; and any seven men engaged in the same industry may form a registered union. Either employers or employees may apply for conciliation, in which case the other side is compelled to come before the board and to abide by its decisions, or to appeal to the court of arbitration. The decisions of the latter are final and failure to obey them "may be punished or not at the discretion of the court."

## Publications Received.

A TREATISE ON ROADS AND PAVEMENTS.—By Ira O. Baker, C.E., Professor of Civil Engineering, University of Illinois. New York: John Wiley & Sons. Cloth; 6 × 9 ins.; pp. 655; 68 tables and 171 illustrations. $5.

DISINFECTION AND DISINFECTANTS.—A Practical Guide for Sanitarians, Health and Quarantine Officers. By M. J. Rosenau, M.D., Director of the Hygienic Laboratory and Passed Assistant Surgeon, U. S. Public Health and Marine-Hospital Service, Washington, D. C. Philadelphia: P. Blakiston's Son & Co. Cloth; 6 × 8 ins.; pp. 353; 97 illustrations. $2 net.

THE TEXTILE FIBERS OF COMMERCE.—By William I. Hannan. London: Chas. Griffin & Co. Philadelphia: J. B. Lippincott Co. Cloth; 6½ × 9 ins.; pp. 236; 149 illustrations. $3 net.

ANCIENT ATHENS.—By Ernest Arthur Gardner, Yates Professor of Archaeology in University College, London. New York: Macmillan & Co. Half leather; 6 × 9 ins.; pp 579; many illustrations. $5 net.

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SURVEYING AS PRACTISED BY CIVIL ENGINEERS AND SURVEYORS.—By John Whitelaw, Jr., Assoc. M. Inst. C. E. London: Crosby, Lockwood & Son. New York: D. Van Nostrand Co. Cloth; 6×8 ins.; pp. 516; tables and 260 illustrations. $4 net.

THE ART OF ILLUMINATION.—By Louis Bell, Ph. D. New York: McGraw Publishing Co. Cloth; 6×9 ins.; pp. 345; 127 illustrations. $2.50.

ELECTRICAL PROBLEMS FOR ENGINEERING STUDENTS.—By Wm. L. Hooper, Ph. D., Professor of Electrical Engineering, Tufts College, and Roy T. Wells, Senior Fellow in Physics, Clark University. Cloth; 6×8 ins.; pp. 170; tables and illustrations.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION.—Proceedings of the Tenth Annual Meeting, June, 1902, and Index, Vols. I.—X. Edited by Robert Fletcher, Calvin M. Woodward and Clarence A. Waldo, Committee. New York: Engineering News Publishing Co. Cloth; 6×9 ins.; pp. 300; tables. $2.50.

HARDENING, TEMPERING, ANNEALING AND FORGING STEEL.—By Joseph V. Woodworth. New York: Norman W. Henley & Co. Cloth; 6×9 ins.; pp. 288; 201 illustrations. $2.50

## The January Literary Magazines.

A journey down the Nile from Khartoum in an Adirondack canoe is the subject of a series of papers begun in this month's "Century." The present instalment relates to the journey by rail from Cairo to Khartoum, and the writer (Mr. W. G. Erving) pays a high compliment to the Baldwin locomotives in service on the railway built by Lord Kitchener from the head of navigation at Wady Halfa to Khartoum. We quote as follows:

> No sane man would think of traveling by any other than the express, drawn by Baldwin locomotives, for, given the roadbed and track, they reach their destination somewhere nearly on time, while the European locomotive may spend a day or two by the wayside undergoing repairs. Passengers rejoice in the "Americans"; their drivers delight in the ease of cleaning and oiling them; they pull very much heavier loads than their European rivals, and the only complaint I heard was that for this extra efficiency they required more coal—a very important item in the Sudan—and more oil.

These express trains, it may be added, make the run from Halfa to Khartoum, 572 miles, in 30 hours, an average speed of 19 miles, which we need hardly say is an exceedingly creditable performance on such a line and in such a country. These expresses leave Halfa twice a week. There is also a daily train which takes two or three days for the run.

Two excellent contributions to the discussion on Trusts are also to be found in the "Century." Dr. Albert Shaw, in the first, reviews the attitude of President Roosevelt toward the trusts, and—what is not less interesting—the attitude of the Trusts toward President Roosevelt. The other paper describes the so-called Sugar Trust, and not in the most complimentary terms.

The article of greatest scientific interest in the "Century," however, and of great popular interest as well, is the account of explorations of the volcanoes of Pelee and Soufriere undertaken last summer by Mr. Geo. Carroll Curtis, of the U. S. Geological Survey. These explorations were made in June last when the volcanoes were still in active eruption and when the work was done at imminent risk of life. This, in connection with previous "Century" papers on this subject, forms probably the best published record of these fatal volcanic outbreaks.

"Becquerel Rays" is the subject of an interesting paper by Prof. J. J. Thomson in the January "Harper." The remarkable properties of uranium, thorium, etc., described in this paper, form a new chapter in the science of physics with which the general public and even most technically educated men are wholly unfamiliar.

"The Old Route to Orleans" is the taking title of the opening paper in this month's "Scribner." The route referred to is, as may be guessed, the Mississippi River, and the writer tells an interesting tale of the history and the present-day condition of navigation on the Mississippi from Minneapolis to New Orleans.

A most excellent summary of the progress made during the past quarter century in sanitary science and in the prevention of contagious disease, we find in the current "Atlantic." The paper is by Mr. C. E. A. Winslow, an instructor at the Massachusetts Institute of Technology. Some statistics given in this paper of the number of lives saved through sanitary methods should be useful to engineers engaged in municipal service in working for better conditions in their own cities.

In the "Review of Reviews" we find an excellent account of the late Friedrich Krupp and of the great Krupp steel works. We may note that on Jan. 1, 1902, the total number of employees of the Krupp firm was 43,083.

"Shall we Reduce the Iron and Steel Tariff" is the title of a paper by Mr. Archer Brown in the January "North American." Mr. Brown takes a very conservative and protectionist view of the industrial situation, but concludes that the iron and steel schedules "should be cut in two, but by a graduated scale, to avoid shock." In the same magazine we find an interesting paper on commercial education from the pen of Prof. W. J. Ashley, late Professor of Economic History at Harvard and now head of the Faculty of Commerce in the University of Birmingham, England.

In "The Forum" for January-March, Prof. L. M. Haupt writes on "Waterways an Economic Necessity." We shall take space to criticise only one of Professor Haupt's statements. He says:

> Statistics show that the cost of transportation by these artificial channels (canals) is only about one-third of that by rail. . . . A nation that ignores an economy of 66% in transportation is wasting its resources and imposing onerous burdens upon its people.

We know of no statistics anywhere to support such a statement. The fact is—as has been repeatedly shown in this journal—that water transportation by artificial water channels is fully as costly as rail transport, when all the elements of cost are taken into account.

Concluding our survey of the magazines with a glance at the English reviews, we may note that the immigration from the United States to the Canadian Northwest is attracting attention in England and is discussed by writers in both the "Fortnightly" and the "Nineteenth Century." The latter magazine has two articles of especial interest to Americans: "America's Bid for Naval Supremacy," by Mr. A. S. Hurd, and "The Weak Spot in the American Republic," by J. Weston. This "weak spot," we may explain, is the slow rate of increase—or rather alarming rate of decrease—in the native American stock, so that only European immigration and the progeny of recent European immigrants prevents our population from standing still or falling off.


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In Calculating the Weights of

PRISMOIDAL FIGURES.

A correspondent in East Cleveland, O., writes:

"Sir: Having had occasion recently to calculate the weights of several prismoidal figures, whose dimensions were expressed in feet, inches and fractions of an inch, I found that the use of "Smoley's Tables" greatly facilitated the work. Thinking that the method might be of interest to many readers of Engineering News, I hereby submit it.

In Smoley's tables we have the logarithms and squares (the latter given in feet and decimals of a foot) of quantities expressed in feet, inches and fractions of an inch, varying by thirty-seconds of an inch. To use these tables in calculating the weight of a prismoidal figure, let the weight of the prism be called $x^2$, the three dimensions of the prism, a, b and c, and let H equal the weight of a cubic foot of the substance.

Then the required weight is equal to

$$x^2 = a\ b\ c\ H,$$

and

$$\log a + \log b + \log c + \log H = 2 \log x;$$

or,

$$\tfrac{1}{2} (\log a + \log b + \log c + \log H) = \log x. \quad (1)$$

Since the tables give the second power of the root parallel with its logarithm, we can read $x^2$ direct from its logarithm, which is the weight sought. . . . .

In conclusion, permit me to say, that I think the engineering and architectural professions are greatly indebted to Engineering News for its publication of "Smoley's Tables," as their advent has reduced the drudgery of the calculations of framed structures by fully one-half, and the writer hopes that his modest suggestions may tend to reduce tedious work along other lines."

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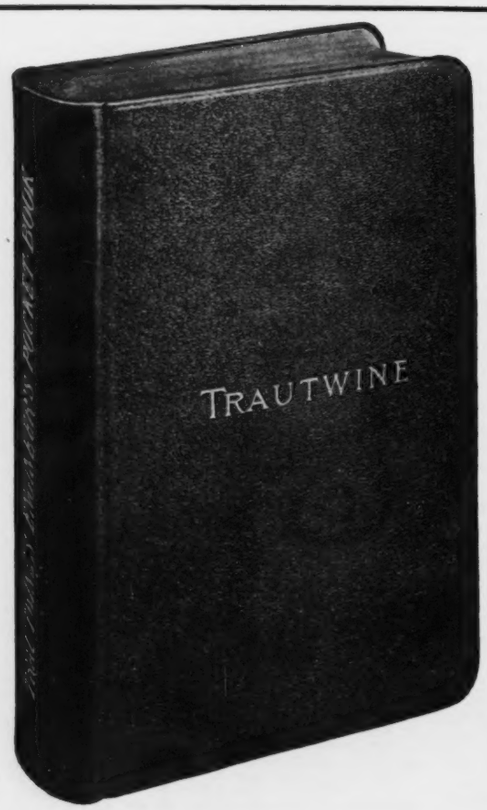


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